

EA-1008; Final Sitewide Environmental Assessment and FONSI EA-1008 for Continued Development of Naval Petroleum Reserve No. 3 (NPR-3)

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ABBREVIATIONS AND ACRONYMS

AQCR	Air Quality Control Region
ASP	Alkaline-Surfactant-Polymer (flood)
AUM	Animal Unit-Month
CAEDA	Casper Area Economic Development Alliance, Inc.
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
COE	U.S. Army Corp of Engineers

CO ₂	Carbon Dioxide Gas
CX	Categorical Exclusion
DOE	U.S. Department of Energy
EA	Environmental Assessment
EOR	Enhanced Oil Recovery
FD	Fluor Daniel (NPOSR), Inc.
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FWS	U.S. Fish & Wildlife Service
H ₂ S	Hydrogen Sulfide
JBEC	John Brown E&C, Inc. (previous M&O contractor)
LPG	Liquified Petroleum Gas
MEOR	Microbial Enhanced Oil Recovery
MER	Maximum Efficient Rate
M&O	Management and Operation
NEPA	National Environmental Policy Act
NORM	Naturally Occurring Radioactive Material
NO _x	Nitrogen Oxides
NOSR	Naval Oil Shale Reserves
NPDES	National Pollutant Discharge Elimination System
NPOSR-CUW	Naval Petroleum and Oil Shale Reserves in Colorado, Utah and Wyoming
NPR-3	Naval Petroleum Reserve No. 3
NTCHS	National Technical Committee for Hydric Soils
NWI	National Wetland Inventory
OSHA	Occupational Safety & Health Administration
PCB	Polychlorinated Biphenyl
RCRA	Resource Conservation & Recovery Act
RMOTC	Rocky Mountain Oilfield Testing Center
SARA	Superfund Amendment Reauthorization Act
SCS	U.S. Soil Conservation Service
SHPO	State Historic Preservation Officer
T&E	Threatened and Endangered
TDS	Total Dissolved Solids
TPQ	Threshold Planning Quantities
TSD	Treatment, Storage and Disposal
TSP	Total Suspended Particulates
UIC	Underground Injection Control
USDA	U.S. Department of Agriculture

USDW	Underground Sources of Drinking Water
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VPD/ADT	Vehicles Per Day/Average Daily Totals
WGFD	Wyoming Game and Fish Department
WNDDDB	Wyoming Natural Diversity Data Base
WYDEQ	Wyoming Department of Environmental Quality

EXECUTIVE SUMMARY

This Sitewide Environmental Assessment (EA) has been prepared for the United States Department of Energy to address the Proposed Continued Development of Naval Petroleum Reserve No. 3 (NPR-3) over the next five years. NPR-3, or Teapot Dome, is a 9,481-acre (3,837 ha) oilfield located in Natrona County, Wyoming, approximately 35 miles (56 km) north of the City of Casper. The United States Department of Energy (DOE) has managed NPR-3 for oil recovery at the "Maximum Efficient Rate" (MER) since 1976. The Sitewide EA has been prepared for the DOE in order to comply with the National Environmental Policy Act of 1969 (NEPA), (42 USC 4321, et. seq.), the DOE's implementing regulations for NEPA (10 CFR 1021) and the DOE's NPOSR-CUW NEPA Guidance Manual (DOE, 1992a).

The Proposed Action is the continued development of NPR-3 for the next five years. Continued development includes all activities typically required to profitably manage a mature stripper oilfield, such as NPR-3, at the MER. Continued development comprises four general categories of activity: continued development drilling utilizing conventional oil recovery technologies; continued and expanded use of Enhanced Oil Recovery (EOR) techniques that are necessary for continued oil production from reservoirs after primary or secondary recovery; continuation of general operations and support activities; and full implementation of the Rocky Mountain Oilfield Testing Center.

Continued development activities either have no potential to result in adverse environmental impacts or would only result in adverse impacts that could be readily mitigated. This Sitewide EA summarizes the potentially affected environment at NPR-3 as of 1994, discusses all potentially adverse environmental impacts, and proposes specific mitigation measures that offset each identified adverse impact. Resource types discussed in detail include land resources, air quality and acoustics, water resources, geology and soils, biological resources, cultural resources, socioeconomics, and waste management.

Continued development of NPR-3, as outlined in the Proposed Action, would not substantially alter the character of existing operations and would be consistent with NPR-3's historic role as an oilfield. Continued development is not expected to result in major changes in the types and quantities of air emissions and wastewater discharges already generated by existing operations at NPR-3. Continued development, especially where it involves expansion of EOR activities, would result in small areas of new land disturbance at several locations on NPR-3, especially in the already intensively developed central area.

Alternatives to the Proposed Action that were reviewed include: other chemical and thermal EOR technology alternatives to maintain oil and gas production, divestiture of NPR-3 by the Federal government, a no-action alternative of continuing operation of NPR-3, but without further development, and the immediate decommissioning of the project.

Table i-1 ISSUES TRACKING MATRIX

Issue	Executive Summary	Section 1.0 Purpose & Need	Section 2.0 Alternatives	Section 3.0 Affected Environment	Section 4.0 Environmental Consequences
Land Resources	i	1-4	2-2, 2-6, 2-12, 2-	3-1, 3-4	4-1, 4-2, 4-3

			15, 2-16		
Air Quality	i	1-4	2-11, 2-15, 2-16	3-4, 3-5, 3-6	4-4, 4-5, 4-6
Water Resources	i	1-4, 1-5	2-12, 2-13, 2-15, 2-16	3-6, 3-7, 3-8, 3-9	4-6, 4-7, 4-8, 4-9, 4-10, 4-11
Geology & Soils	i	1-4	2-2, 2-6, 2-7	3-10, 3-13, 3-17	4-11, 4-12, 4-13
Biological Resources	i	1-4, 1-5	2-12, 2-13, 2-16	3-17, 3-18, 3-20, 3-21, 3-22, 3-25, 3-26, 3-27	4-13, 4-14, 4-15, 4-16, 4-17, 4-18, 4-19, 4-20
Cultural Resources	i	1-4	2-1, 2-15, 2-16	3-28, 3-29	4-20, 4-21
Socio-economics	i	1-4	2-15, 2-16	3-29, 3-30, 3-31	4-22, 4-23, 4-24
Waste Management	i	1-4	2-13	3-32, 3-33, 3-34, 3-35, 3-36	4-24, 4-25

1.0 PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

This Sitewide Environmental Assessment (EA) is prepared to address the Proposed Continued Development of Naval Petroleum Reserve No. 3 (NPR-3, or Teapot Dome), a 9,481-acre (3,837 ha) oilfield owned by the U. S. Department of Energy (DOE) in Natrona County, Wyoming (Figure 1-1). NPR-3 is operated under a Management and Operation (M&O) contract by Fluor Daniel (NPOSR) Inc., hereinafter referred to as FD. The Sitewide EA has been prepared for the DOE in order to comply with the National Environmental Policy Act of 1969 (NEPA), (42 USC 4321, et. seq.), the DOE's implementing regulations for NEPA (10 CFR 1021) and the DOE's NPOSR-CUW NEPA Guidance Manual (DOE, 1992a).

NPR-3 was created by Executive Order of President Wilson in 1915 as an emergency source of liquid fuels for the military. Production began in the 1920s during a time of substantial exploration and production, when leases were issued by the Interior Department under the Mineral Leasing Act. Production was discontinued after 1927 and renewed between 1959 and 1976 in a limited program to prevent the loss of U.S. Government oil to privately-owned wells on adjacent land.

In response to the Arab oil embargo of 1973-74, which demonstrated the nation's vulnerability to oil supply interruptions, Congress authorized and directed, in 1974, that the Naval Petroleum Reserves be explored and developed to their full economic and productive potentials. In 1976, Congress formally passed the Naval Petroleum Reserves Production Act (Public Law 94-258), which required that the Naval Petroleum Reserves be produced at their maximum efficient rate (MER), consistent with sound engineering practices, for a period of six years. The law also provided that at the conclusion of the initial 6-year production period, the President (with the approval of Congress) could extend production in increments of up to three years each, if continued production was found to be in the national interest. The President has authorized five 3-year extensions since 1982, extending production continuously through April 5, 1997.

This Sitewide EA is prepared to address continued development activities at NPR-3 for the next five years. Substantial changes are currently proposed to the scope and character of existing production activities at NPR-3 that necessitate new NEPA documentation beyond that approved in 1990. This Sitewide EA serves both to update the 1990 EA to reflect 1994 conditions and to revise the 1990 EA to reflect the changes in production strategy that have occurred since that time.

An Environmental Impact Statement (EIS) was approved in 1976 for the initial development of NPR-3 (U.S. Navy, 1976). A subsequent EA for continued development of NPR-3 was approved in 1990, under which present operations at the Reserve are covered (DOE, 1990). In addition, DOE prepared an EA (DOE/EA-0334) in 1988 that analyzed the difference in the environmental and socioeconomic impacts of the development and operation of NPR-3 that would be caused by changing ownership from the public to the private sector. A Finding of No Significant Impact (FONSI) was issued for the proposal to sell NPR-3, although no further consideration has been given to the proposal to sell the Federal Government's ownership interest in NPR-3.

1.2 Decisions needed

Decisions that must be made regarding the material in this document include:

- Whether any significant issues have been raised by the Proposed Action or any of the alternatives;
- Whether the Proposed Action or any of the alternatives would result in significant impact to the environment; and
- Whether the DOE would prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) in response to this Environmental Assessment.

1.3 Scoping Summary

1.3.1 Internal Scoping

Meetings were held between the DOE, its Management and Operation (M&O) Contractor - FD and the consulting firm Halliburton NUS. DOE and Contractor staff determined the probable level of activity over the next five-year period and supplied the necessary background information. Halliburton NUS conducted site surveys, reviewed available background information, and recommended the general scope of the EA. DOE and FD adopted their proposed scope and it appears in Sections 3.0 and 4.0.

1.3.2 External Scoping

Several meetings were held with local, state and Federal agencies to provide them with the opportunity to present key areas of concern that should be addressed in the document. Governmental Agencies that were contacted include:

- U. S. Fish & Wildlife Service
- State Office of Historic Preservation
- U. S. Department of Agriculture
- Natrona County Planning Department
- Soil Conservation Service
- Wyoming Game and Fish Department
- Natrona County School District
- Wyoming Transportation Department

1.4 Discussion of Major Issues

Two major issues have been determined as a result of consultations with governmental agencies. These issues are:

From the U. S. Fish and Wildlife Service:

Additional area would be disturbed for new wells, roads, pipelines and production facilities. As a result, there may be some impact to the local biological community because the total area available for vegetation and wildlife would also decrease by a corresponding amount. Additional development may otherwise stress wildlife including big game, raptors, migratory

species, and Threatened and Endangered (T&E) species by creating additional traffic, oilfield pits, power poles, and other hazards to wildlife.

From the Wyoming State Office of Historic Preservation:

Previous archaeological and cultural resource surveys no longer meet current standards. SHPO wants to ensure that all sites have been identified, recorded, collected or preserved. Additional surface disturbance may inadvertently impact those sites.

The remainder of the agencies contacted indicated that they could not foresee any major issues resulting from the Proposed Action or any of the Alternatives.

1.5 Summary of Federal Permits, Licenses, and Entitlements

[Table 1-1](#) presents information regarding environmental permits at NPR-3. Most of the permits presented in this table are for federal programs for which the State of Wyoming has obtained primacy. For example, the Wyoming Department of Environmental Quality (WYDEQ) regulates and permits wastewater discharges under the National Pollutant Discharge Elimination System (NPDES), as described in the Clean Water Act. The Department of Energy generally holds the permits, except that the Contractor (Fluor Daniel) obtains routine permits from the Wyoming Oil and Gas Conservation Commission. In Table 1-1, permits for Underground Injection Control fall into this group.

In addition to the current permits, it is believed that several new air quality permits would be required in order to comply with the provisions of the Clean Air Act Amendments of 1990. The need for an Operating Permit under Title V of the Clean Air Act has been identified and the application is currently being prepared by a consulting firm.

Second, it is possible that some construction projects may disturb an area greater than 5 acres. In this case, a stormwater discharge permit would be obtained from WYDEQ, Water Quality Division.

Also, it is envisioned that the number of active NPDES permits would be substantially reduced, since many of the permitted facilities no longer discharge. One research project proposed for RMOTC involves the creation of a biological treatment area designed to use halophytic (salt-loving) plant species to bind chlorides in produced water and lower its toxicity. If successful, biological treatment and surface discharge of produced water would be preferable to underground injection.

Underground Injection Control (UIC) permits for oilfield water injection in Class II wells would remain relatively stable although the specific wells would change as areas of the field are depleted and other areas are brought under injection.

1.6 Preview of Remaining Chapters

Five alternatives, including the Proposed Action are considered in this Sitewide EA and are discussed in Section 2.0. They include:

1) The Proposed Action, which is composed of four principal components:

Continued infill and development drilling of NPR-3 utilizing conventional oil recovery technologies.

Continuation and expansion of the use of Enhanced Oil Recovery (EOR) techniques required to profitably extract additional oil from oil-bearing geological strata (reservoirs). Specific EOR technologies considered under the Proposed Action are also discussed in Section 2.0.

Continuation of general operations and support activities at NPR-3, including the continued use and expansion of the existing infrastructure comprising oil transport pipelines, water treatment facilities, warehouses, office facilities, roads, and electric distribution and transmission lines.

The development of the Rocky Mountain Oilfield Testing Center at NPR-3, whose purpose would be to provide facilities and necessary support to government and private industry for testing and evaluating new oilfield and environmental technologies, and to transfer these results to the petroleum industry through seminars and publications.

2) An Additional EOR Technology Alternative under which one or more EOR technologies, other than those considered under the Proposed Action, would be implemented as a substitute for drilling activity. General operations and support activities would continue as needed to supply and support the changed focus.

3) A Divestiture Alternative under which the DOE would sell or lease NPR-3 to one or more private concerns, effectively privatizing oil development on the Reserve.

Table 1-1 Federal Permits in Effect at NPR-3

Item	Permit No.	Facility
Air Quality (Stack Permits)	CT-360	Gas Plant Heat Transfer Fluid Heater
	CT-361A	Gas Plant Smokeless Flare
	CT-361A-2	Steam Generator No. 1
	CT-778	Steam Generator No. 2
	CT-850	Steam Generator No. 3
	CT-874	Steam Generator No. 4
	CT-937	Steam Generator No. 5
Water Quality (NPDES Permits)	WY-0028894	B-1-3 Tank Battery
	WY-0028908	B-1-10 Tank Battery
	WY-0028932	B-2-10 Tank Battery
	WY-0028274	B-TP-10 Tank Battery
	WY-0028916	B-1-28 Tank Battery
	WY-0028924	B-1-33 Tank Battery

	WY-0031895	North Waterflood
	WY-0032115	Water Disposal Facility
	WY-0034029	Steam Generator No. 2
	WY-0034495	Steam Generator No. 3
	WY-0035076	Steam Generator No. 4
	WY-0035297	Steam Generator No. 5
	WY-0034037	Water Treatment Facility
	WY-0034126	North Waterflood Floor Drains
Solid Waste	NPR-Ind #2	Operation of NPR-3 Industrial Landfill
	1-2 permits per year	Application of crude oil sludge to NPR-3 Roads
Ground Water Appropriation	UW-60713	B-1-3 Tank Battery
	UW-60714	B-1-10 Tank Battery
	UW-60715	B-2-10 Tank Battery
	UW-60716	B-TP-10 Tank Battery
	UW-60717	B-1-14 Tank Battery
	UW-60718	B-1-20 Tank Battery
	UW-60719	B-1-28 Tank Battery

	UW-60720	B-2-28 Tank Battery
	UW-60721	B-1-33 Tank Battery
	UW-60722	B-1-35 Tank Battery
	UW-43810	17-WX-21 Madison Water Well
	UW-85156	57-WX-3 Madison Water Well
Underground Injection Control	No permit number issued	124 Water Injection Wells
	No permit number issued	34, 51 & 74-CMX-10 for Oilfield Brine Disposal
	No permit number issued	86-LX-10, 25-LX-11, 14-LX-28
Underground Storage Tanks	963-1	Diesel Storage Tank
	963-2	Unleaded Gasoline Storage Tank
	963-3	Unleaded Gasoline Storage Tank
EPA Hazardous Waste ID No.	WY 4890090042	Hazardous Waste Disposal ID for NPR-3 (Also amended for PCB activity)

4) A No-Action Alternative, under which NPR-3 would continue to be produced using present conventional and enhanced oil recovery technologies, but whereby no new development activities would be implemented. Petroleum production would begin to decline to the economic limit of the project, but the RMOTC would provide a purpose for continuing limited operations at NPR-3 after that time. General operations and support activities would continue as needed to support the limited activity.

5) A Decommissioning Alternative in which the DOE would promptly cease commercial operation of NPR-3 and begin environmental restoration.

The affected environment on and surrounding NPR-3 is characterized in Section 3.0. This characterization has been updated from the earlier characterizations provided in the 1976 and 1990 NEPA documents to reflect present conditions at NPR-3. Environmental consequences potentially resulting from the Proposed Action and each alternative are discussed in Section 4.0, which also details the mitigation measures necessary to offset any potential adverse environmental consequences identified for the Proposed Action. A discussion of potential cumulative impacts from the Proposed Action is also provided in Section 4.0, as are the potential impacts from the Alternatives to the Proposed Action. Sections 5.0, 6.0 and 7.0 provide a list of preparers, agencies and persons consulted, and bibliography, respectively.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

Elements of the Proposed Action for continued development of NPR-3 are described below (Section 2.1). This is followed by a discussion of alternatives to the Proposed Action (Section 2.2), including Additional EOR Technology Alternatives (Section 2.2.1), Divestiture of NPR-3 (Section 2.2.2), the No-Action Alternative (Section 2.2.3), and the Decommissioning Alternative (2.2.4).

2.1 Proposed Action

The DOE has developed a number of continued development projects which could be implemented to continue maximum efficient rate (MER) production at NPR-3 for the next five years. For a mature stripper field such as NPR-3, MER corresponds to the maximum economic rate of withdrawal, which is highly dependent upon the price of petroleum and associated products on the open market. Since 1986, wide swings in petroleum prices have been experienced, with prices ranging from \$11 per barrel to over \$40 per barrel. The Proposed Action has therefore been designed to encompass several projected ongoing and new projects. While some of these new projects may not be economically feasible under current oil prices, their inclusion in the Proposed Action allows for greater flexibility in planning NPR-3 activities, providing contingencies for changing market conditions. The Proposed Action addresses the specific NPR-3 activities identified in [Table 2-1](#).

Continued development activities under the Proposed Action would include the drilling of approximately 250 oil production and injection (gas, water, and steam) wells, the construction of between 25 and 30 miles of associated gas, water, and steam pipelines, the installation of several production and support facilities, and the construction of between 15 and 20 miles of access roads. This work would be performed over the next five years. Since excavation and construction are important parts of this alternative, one could expect further impact to land resources, biological resources, and cultural resources.

In addition to the continued development of oil and gas resources to support production at the MER, it is proposed to fully develop the Rocky Mountain Oilfield Testing Center (RMOTC). The mission of RMOTC is to provide facilities and necessary support to government and private industry for testing and evaluating new oilfield and environmental technologies, and to transfer these results to the petroleum industry through seminars, training, and publications. This project is already partially at work at NPR-3, providing assistance on small projects that fall under DOE Categorical Exclusions (CXs). The goal would be to improve the economics of oil production at NPR-3 and other stripper oilfields. Since much of the country's domestic oil supply remains in older, marginally economic fields, RMOTC would provide research and development (R&D) benefits to the oil producers most in need of technological assistance. Construction requirements are included in the totals discussed in the previous paragraph.

As noted in Section 1.0, activities under the Proposed Action generally correspond to four major program elements: 1) Continued Drilling Activity; 2) Enhanced Oil Recovery (EOR); 3) General Operations and Support Activities; and 4) Development and Operation of RMOTC. Proposed developments associated with these program elements are discussed below. Specific activities which are included within these program elements are presented in Tables 2-2 through 2-4.

2.1.1 Continued Drilling Activity

Several programs are planned to continue drilling at NPR-3. The geology of NPR-3 and the surrounding area is very complicated; there are at least 11 different geologic formations that have yielded oil. Numerous faults further divide each oil producing zone into many separate reservoirs. Geologists and petroleum engineers may review available geologic data and find areas of the field that are not being adequately drained by existing wells. The technical staff may also find that there is oil production possible outside the previously defined boundary of the petroleum reservoir. Drilling activity designed to exploit those areas is called *development drilling*.

NPR-3 would usually employ conventional oilfield technology to drill vertical wells. In general, a rotary drilling rig

would drill a 12- to 15-inch diameter hole deep enough to protect surface waters and potential groundwater resources. While the well is being drilled, compressed air or drilling mud would be pumped down the inside of the drill pipe and circulated back up the outside of the pipe in order to carry the rock chips out of the well. **Drilling mud** is actually a very special fluid containing sodium bentonite (a type of clay) and other additives. Steel casing would then be run into the well and cemented in place. This is called the **surface casing**. The drilling tools would then be run inside the casing to the bottom of the well and begin drilling again where the first drilling phase ended. Drilling would continue until the objective is reached. The drilling tools would then be removed from the well and electronic instruments (**logging tools**) would be lowered into the well to measure various properties of the rock formations that were penetrated. Those instruments may contain radioactive sources. The next string of steel casing (production casing) would be run to the bottom of the well and cement would be pumped into the annular space between the outside of the casing and the rock wall of the well. After this phase is completed, the drilling rig would be moved off of the well and completion operations would begin.

Directional drilling is a modification of routine vertical drilling in which the well would start vertically, and then is slowly curved in order to reach a particular geographic location within the oil zone. The process of drilling would be the same as for vertical drilling, but special tools would also be used in order to steer the well on a specific compass heading. Usually this is done because the surface location directly above the target is inaccessible or otherwise unavailable for the drilling rig. Alternatively, several wells could be drilled from one larger location in order to minimize surface occupancy or impact.

Table 2-1 List of Continued Development Projects Under the Proposed Action

Maintenance and installation of fences.
Siting, construction and maintenance of buildings.
Emergency response and fire training exercises.
Maintenance of roads and locations.
Maintenance, construction or modification of pits, boxes or tanks including bird netting and liner installation.
Environmental sampling and monitoring as required by Federal, state and local regulations and permits.
Development of a program to evaluate Naturally Occurring Radioactive Materials (NORM) issues.
Dismantling of electrical distribution lines to abandoned wells and reclaimed locations.
Tapping and installing electrical tap lines for new installations.
Electrical transmission line repair, modification, relocation or expansion.
Electrical substation construction or modifications.
Communications and electronic equipment installation, repair and maintenance.
Hazardous material clean-up, storage and disposal.
Operation, maintenance and modification of hazardous waste accumulation areas.

Emergency planning and evacuation routes.
Data gathering and process sampling.
Relocation of existing equipment.
Polychlorinated Biphenyls (PCB) removal, handling and disposal.
Routine maintenance activities as defined in DOE NEPA regulations.
Recompletions of existing wells in other reservoir intervals.
Recompletions of existing wells in current reservoir intervals.
Pump and piping configuration modifications.
Pipeline construction, maintenance, repair or replacement.
Construction of new pipelines and related facilities.
Waste collection and waste treatment facility construction, operation and maintenance.
Leasing and oversight of grazing activities.
Research and technology demonstration projects of limited scale and impact run by RMOTC.
<p>Water disposal activities including:</p> <ul style="list-style-type: none"> a) Drilling additional Class II disposal wells in the Crow Mountain formation, as well as any other formation that may be approved; b) Installing flowlines to disposal wells; c) Adding pump(s) or pump capacity to water disposal facility, and production facilities to ship increased water volumes; d) Constructing a new water disposal facility; e) Converting existing water disposal facility to a chase waterflood facility; f) Siting, design and installation of equipment such as tanks, pumps, separators and pipelines, to treat produced water so that it could be recycled in chase water, waterflood supply, or for steam generator feed water; g) Adding tanks, separators, filters, or other water treatment equipment at production facilities and the water disposal facility, for treatment and storage of produced water; h) Constructing new production test facilities to support new wells and steamflood development, or expanding the capacity of existing facilities by adding equipment such as pumps, tanks, piping,

flowlines, separators, electrical equipment and buildings; and

i) Constructing a biotreatment facility to treat oil and grease in produced water and discharge under an NPDES permit.

Crude oil sludge and contaminated soils handling activities including:

- a) Storage;
- b) Transportation;
- c) Centrifuge;
- d) Road application;
- e) Construction of a new landfarm or expand the existing landfarm;
- f) Using biological and chemical accelerators to speed up the decomposition of petroleum contaminated materials;
- g) Composting; and
- h) Off-site disposal.

Chase water injection activities designed to inject water into oil-bearing formations behind steam injection; including:

- a) Converting wells from production to injection (or the reverse);
- b) Installing flowlines; and
- c) Constructing injection facilities, including pumps, tanks, electrical installations, and buildings.

Hydrogen sulfide (H₂S) treatment and control activities including:

- a) Testing;
- b) Building and operation of a pilot facility;
- c) Installation of two-phase separators at test facilities;
- d) Install low pressure gas gathering system and construct pipeline to existing gas processing plant;
- e) Installation of amine H₂S removal system at existing gas processing plant;
- f) Installation of amine H₂S removal system at existing test facilities;
- g) Disposal or recycling of spent amine;

- h) Regeneration of spent amine on-site;
- i) Installation of additional natural gas compressors; and
- j) Chemical, microbial or biocide treatment of wells for H₂S control.

Design, permitting, and construction of a new solid waste disposal facility and landfill.

Procurement and transportation of drinking water from a regulated municipal water source.

Cathodic protection projects including:

- a) Drilling deep bed anode holes; and
- b) Installing transformers and electrical lines necessary for operation of an impressed current cathodic protection system.

Use of gas tracers, foamers, polymers, gels and surfactants in the steam drive patterns to aid in mobility control.

Gas processing plant expansion or modification as required to meet demands. May consist of adding, moving or resizing equipment.

Reclamation of right-of-ways, pits, production facilities, well pads, and other abandonment activities.

Construction or enlargement of production, workover, or evaporative pits, both for temporary and long-term application.

Installation of a vehicle wash facility with water recycling capability.

Installation, operation and maintenance of air quality and meteorological monitoring stations.

Injection of air or natural gas for reservoir pressure maintenance and/or gas storage.

Implementation of Shannon formation waterflood.

Participation with adjoining mineral rights holders for drilling wells under a cooperative agreement.

Use of polymers and gel conformance treatments to improve reservoir conformance.

Drilling and completion of new production and injection wells using vertical, directional or horizontal drilling technology and techniques.

Relocation sections of existing injection lines from "old" to "new" injectors.

Modification of existing equipment to reduce emissions.

Gas huff 'n puff (cyclic) injection.
Steam huff 'n puff (cyclic) injection.
Conducting emergency response and fire training exercises.
Emergency planning.
Data gathering and process sampling.

Horizontal drilling is a modification of directional drilling in which the well starts vertically, and then is slowly curved all the way to horizontal within the oil zone. The well may continue for several thousand feet horizontally before drilling is stopped. Surface occupancy is virtually identical to that of a vertical well, except that larger production equipment is required. This is because one horizontal well may tap the same geographic area as two or more vertical wells. The increased efficiency of one horizontal well would tend to reduce the number of well locations required.

The **completion** phase of operations involves establishing oil and/or natural gas production from the well. At the end of drilling, the well would still be completely sealed from the petroleum producing rock by the well casing and cement. In order to establish production from the well, a truck-mounted well servicing rig would be set up over the well. This rig is also known as a **pulling unit** or **workover rig**. Additional logging tools would be lowered into the well that measure the quality of the cement between the production casing and the rock. This is important because the cement must be completely impermeable and must prevent fluids from migrating up and down within the annular space. If the well logs showed a poor cement bond, additional cementing would be required. Assuming a good reading, shaped explosive charges called **perforating charges** would then be lowered into the well and detonated inside the casing, adjacent to the oil producing formation. Each charge would punch a 1/4 inch diameter hole through the casing, cement, and approximately 24 inches into the rock. This would allow oil and gas to flow into the well if it is to become a producer, or it would provide a way for water or gas to be injected into the targeted formation.

In most cases, however, the flow rate into the well would be too slow and it would be **stimulated** in order to achieve an economic production rate. Two alternatives are available to improve production: chemical treatment and hydraulic fracturing. Chemical treatment may include pumping hydrochloric and/or hydrofluoric acid into the rock formation to improve flow into the well; or it may include other chemicals depending on the circumstances.

If the circumstances indicated its use, an alternative would be **hydraulic fracturing**, which involves pumping fluids into the well under sufficient pressure to cause the oil-producing formation to fracture vertically. The fluid would force the fracture open while coarse sand is pumped into it. When the pressure is released, the fracture would close partially, but would be held open by the coarse sand. This sand-filled fracture would form a highly permeable conduit for fluid flow toward the well from the surrounding rock. A fracture 100 feet long and 1/8-inch wide would be expected to double the production or injection rate. Radioactive tracers may be used in the fracturing fluid in order to determine the vertical extent of the fracture.

After completion, various surface facilities would be constructed. A pipeline would be constructed to a central production facility that would separate produced crude oil, natural gas and water. All materials would be measured and the oil, water, and gas delivered into existing pipelines for further handling. Oil would be transported to a commercial pipeline for transportation to a nearby refinery. Natural gas would be sent to the gas plant for processing and re-injection as part of one of the secondary recovery projects. Water would be collected and disposed of by underground injection.

The previous description is by necessity a simplification. Actual circumstances may justify minor deviation from this summary of well drilling and completion operations.

As stated previously, this project would result in drilling between 250 oil production and injection (gas, water, and steam) wells, one water supply well, the construction of between 25 and 30 miles of associated gas, water, and steam

pipelines, the installation of several production and support facilities, and the construction of between 15 and 20 miles of access roads.

In addition, the potential also exists for the communitization of wells at the site perimeters to prevent drainage of NPR-3 reserves. A detailed listing of specific activities associated with conventional in-fill development is presented in [Table 2-2](#).

2.1.2 Enhanced Oil Recovery

Enhanced oil recovery (EOR) technologies, which utilize fluid injection techniques to maintain reservoir pressure and displace oil, are currently utilized in production of three of the nine currently producing zones: Second Wall Creek, Shannon, and Muddy. Pressure maintenance commenced in the Second Wall Creek Sand in 1979, followed by testing of EOR techniques in the Shannon Sand in 1981, and finally pressure maintenance in the Muddy in 1985. No other productive zones currently offer economic EOR opportunities, although testing the potential for introducing cyclic gas injection into the Lakota reservoir is planned. Though no other projects are currently planned, other similar injection programs may be considered in these and other formations in the future. A detailed listing of specific activities associated with EOR development is presented in [Table 2-3](#). The following specific EOR activities are included as part of continued development of NPR-3:

- Shannon Reservoir Steam Drive (Steamflood) EOR Development: The largest remaining reserve potential on NPR-3 is from the Shannon EOR steam drive, or steamflood. The Shannon sandstone contains large quantities of oil at very shallow depths. The oil lacks any natural reservoir pressure to push oil into wells and production rates have historically been disappointing. Numerous techniques have been attempted over the years to push oil to producing wells but results have been poor. Steam injection was tried because it had three beneficial effects on the trapped crude oil:

It provided the pressure necessary to get oil flowing into wells.

It heated the oil and reduced its viscosity, permitting the oil to flow faster.

It distilled some oil and created solvent that thins the oil.

Since it began in 1985, the project has expanded to five steam generators, which are large gas-fired boilers. Each steam generator is designed to inject steam into five different well patterns for a period of 3 to 4 years each, usually followed by water injection to scavenge heat from the area immediately surrounding the injection well. This last procedure is called *chase water injection*.

The Proposed Action includes continuation of the current operations without notable changes. Associated with each steam generator would be a well pattern consisting usually of 10 steam injection wells, 15 oil production wells, a steam distribution pipeline, and a fuel gas supply system. A water treatment facility, which provides high quality water for steam production and a water disposal system would continue to serve the five generators and associated wells in common. Approximately 3,000 feet (900 m) of surface steam lines would be required for each new steam injection pattern. After steam injection into a pattern is completed, injection would be relocated to a new pattern or to portions of other patterns.

- Reservoir Microbial Treatment: This project would utilize microbial enhanced oil recovery (MEOR) for increasing oil production. Other strains of bacteria may be used to inoculate existing wells for the treatment of hydrogen sulfide (H₂S), carbonate or sulfate scale, and paraffin problems associated with production. Testing of bacteria that could tolerate high temperatures (100° to 110° C, or 212° to 230° F) is of particular interest in the steam-injection area.
- Second Wall Creek Alkaline-Surfactant-Polymer (ASP) EOR Pilot Project: The Northern Second Wall Creek Reservoir is highly faulted and fractured. Despite the

ongoing pressure maintenance program via gas cap injection and pattern waterflood, a sharp decline in oil production has been observed. For this reason, a field pilot test to determine the feasibility of an alkaline-surfactant-polymer (ASP) flood is being considered. A mix of alkaline, surfactant, and polymer agents with Madison water would be injected into the Second Wall Creek to reduce interfacial tension between oil and water. If the pilot test proves successful technically and economically, an expanded program could be implemented to recover additional oil from the northern part of the Second Wall Creek Reservoir and other reservoirs if the technique is found to be applicable.

Table 2-2 List of Continued Drilling Activities (2.1.1)

Pump and piping configuration modification.
Pipeline construction, maintenance, repair or replacement.
Construction or enlargement of production, workover, and emergency pits, both for temporary and long-term application.
Drilling additional Class II disposal wells in the Crow Mountain formation, as well as any other formation that may be approved.
Drilling of additional water supply wells in the Madison formation.
<p>Drilling and completion of new production and injection wells using vertical, directional or horizontal drilling technology and techniques, including:</p> <ul style="list-style-type: none"> a) The use of rotary drilling rigs common to the industry; b) The use of air or drilling mud as a medium for cleaning cuttings from the well; c) The use of steel or fiberglass tubular goods of various sizes for casing and tubing; d) The use of cement blends to seal the annular space between the well and the hole; e) The use of electronic well logs - including those with radioactive sources - to measure the properties of the rock surrounding the well bore; f) The use of concentrated salt brines as completion fluids; g) The use of shaped explosive charges to penetrate well casing, cement, and the outer rock for the establishing of production or injection; h) The use of polymer fluids and/or compressed gasses in hydraulic fracturing treatments; i) The use of hydrochloric and hydrofluoric acid mixtures to clean out wells and restore production or injection; and j) The use of various commercial oilfield treatment chemicals to

prevent the deposition of paraffin and carbonate/sulfate scale and to break oil/water emulsions.
Tapping and installing electrical tap lines for new installations.
Electrical substation construction or modifications.
<p>Construction of new production facilities including:</p> <ul style="list-style-type: none"> a) Pipeline headers and manifolds; b) Pipeline pig launching stations; c) Production test satellites with fluid separators, tanks, chemical injection equipment, metering equipment, and facility operator office; and d) Tank batteries with fluid separators, tanks, chemical injection equipment, metering equipment, tankage for oil and water storage, and facility operator office.

Table 2-3 List of Enhanced Oil Recovery Activities (2.1.2)

Pump and piping configuration modification.
Pipeline construction, maintenance, repair or replacement.
<p>Water disposal activities including:</p> <ul style="list-style-type: none"> a) Drilling additional Class II disposal wells in the Crow Mountain formation, as well as any other formation that may be approved; b) Installing flowlines to disposal wells; c) Adding pump(s) or pump capacity to water disposal facility, and production facilities to ship increased water volumes; d) Constructing a new water disposal facility; e) Converting existing water disposal facility to a chase waterflood facility; f) Siting, design and installation of equipment such as tanks, pumps, separators and pipelines to treat produced water so that it could be recycled in chase water, waterflood supply or for steam generator feed water; g) Adding tanks, separators, filters or other water treatment equipment at production facilities and the water disposal facility, for treatment and storage of produced water; and

h) Constructing new production test facilities to support new wells and steamflood development, or expand the capacity of existing facilities by adding equipment such as pumps, tanks, piping, flowlines, separators, electrical equipment and buildings.

Chase water injection activities designed to inject water into oil-bearing formations behind steam injection including:

- a) Converting wells from production to injection (or the reverse);
- b) Installing flowlines; and
- c) Constructing injection facilities, including pumps, tanks, electrical installations, and buildings.

Use of gas tracers, foamers, polymers, gels and surfactants in the steam drive patterns and waterfloods to aid in mobility control.

Construction or enlargement of production, workover, or evaporative pits, both for temporary and long-term application.

Relocate sections of existing injection lines from "old" to "new" injectors.

Huff 'n Puff (cyclic injection) using natural gas and steam.

Injection of air and natural gas for reservoir pressure maintenance.

Hydrogen sulfide (H₂S) treatment and control activities including:

- a) Testing;
- b) Building and operation of a pilot facility;
- c) Installation of two-phase separators at test facilities;
- d) Installation of low pressure gas gathering system and construction of pipeline to existing gas processing plant;
- e) Installation of amine H₂S removal system at existing gas processing plant;
- f) Installation of amine H₂S removal system at existing test facilities;
- g) Disposal or recycling of spent amine;
- h) Regeneration of spent amine on-site;
- i) Installation of additional natural gas compressors;
- j) Chemical, microbial or biocide treatment of wells for H₂S control; and

k) Construction of flares for the combustion of H ₂ S contaminated natural gas.
Implementation of waterfloods in conducive reservoirs.
Drilling and completion of new production and injection wells using vertical, directional or horizontal drilling technology and techniques.
Installation of tanks at facilities to increase pump head pressure.

- **Huff 'n Puff Treatment:** Several Huff 'n Puff techniques (cyclic injection) would be employed in the Shannon and Lakota zones. Under this project, existing Shannon wells would be injected with steam or natural gas, and Lakota wells would be injected with carbon dioxide. These fluids would be allowed to "soak" into the oil in the producing zone, which would then be pumped back to produce a short-term increase in oil flow. This recovery technology has been applied previously to several wells at NPR-3 with encouraging results. Again, usage of the treatment would be expanded to other formations and areas of the field if information became available that suggested its feasibility.
- **Shannon Waterflood:** This project would involve the construction of a water injection pipeline and the drilling of water injection wells in the Shannon sandstone. The injected water would spread out radially away from the injection wells and displace the existing crude oil toward producing wells. If the pilot project were to be deemed successful, waterflooding would be applied to some portions of the Shannon reservoir outside the steamflood area, possibly on the east or southern sides of the field. Produced water would increase, resulting in increased power usage and disposal capacity at the Water Disposal Facility. Water would be disposed via UIC-permitted injection into the three existing disposal wells. Additional surface disturbance would result from the associated pump stations, pipelines, and injection well pads.

With the installation and ongoing operation of Steam Generators Nos. 1, 2, 3, 4 and 5, effective utilization of produced water for steam make up and effective produced water disposal has been increasingly important. Under the current water handling scheme, all National Pollutant Discharge Elimination System (NPDES) regulations are satisfactorily met. Three Class 2 disposal wells, 74-CMX-10, 34-CMX-10, and 51-CMX-10 have UIC permits to handle produced water as well as brine from the water treatment facility. Several additional disposal wells and related surface equipment are anticipated to be installed as part of continued EOR activities.

2.1.3 General Operations and Support Activities

Implementation of the Proposed Action would require the operation, maintenance, and continued development of support facilities and programs. Items under this program element correspond to activities and infrastructure requirements necessary to support ongoing and projected day-to-day production and operations at NPR-3. Included are all support facilities used for processing crude oil and wet gas, as well as solid waste and waste water disposal operations, field management activities, general maintenance activities, environmental monitoring programs, and health and safety programs. Additional support functions include electrical power distribution systems, potable water and sewer systems, and cathodic protection systems. A detailed listing of specific activities associated with general operations and support is presented in [Table 2-4](#).

One additional program under general operations is the oversight and leasing of grazing activities. A grazing program at NPR-3 would include leases to one or more individuals, for a total of no more than 450 Animal Unit Months (AUM).

Finally, NPR-3 would use its gas reservoirs to seasonally store natural gas for use in the steam generators and for use by other Federal agencies. Gas would be purchased in the summer, when prices were low, and be injected into the gas

reservoirs. The gas would be produced in the winter when priced increase and demand is high. Since the gas plant compressors are electric, the incremental impact of this program would be negligible.

2.2 Alternatives to the Proposed Action

2.2.1 Other EOR Technology Alternatives

Instead of drilling, additional chemical and thermal EOR technology alternatives, other than those in the Proposed Action, would be considered to maintain oil and gas production at the MER. These other processes include chemical injection, carbon dioxide gas (CO₂) or nitrogen gas (N₂) flooding (as opposed to Huff 'n Puff in the Proposed Action), in-situ fireflooding, and oil mining. Such technologies would not be viable alternatives under today's economic conditions due to their high cost and low process performance, but all have technical merit. Serious operational problems would also be associated with these techniques, such as wet CO₂ (carbonic acid) corrosion. In-situ combustion, which has been tried as a pilot project at NPR-3, would present safety problems associated with operation of pressurized oxygen or air systems.

Under this scenario, general operations and support activities would continue as needed to support these different projects. RMOTC would also have a role that would be changed little from that in the Proposed Action.

Table 2-4 List of General Operations and Support Activities (2.1.3)

Maintenance and installation of fences.
Siting, construction and maintenance of buildings.
Emergency response and fire training exercises.
Maintenance of roads and locations.
Maintenance, construction or modification of pits, boxes or tanks including bird netting and liner installation.
Environmental sampling and monitoring as required by Federal, state and local regulations and permits.
Development of a program to evaluate Naturally Occurring Radioactive Materials (NORM) issues.
Dismantling of electrical distribution lines.
Tapping and installing electric tap line for new installations.
Electrical transmission line repair, modification, relocation or expansion.
Production and recompletions in existing well bores.
Hazardous material clean-up, storage and disposal.
Operation, maintenance and modification of hazardous waste accumulation areas.
Emergency planning and evacuation routes.

Data gathering and process sampling.
Relocation of existing equipment.
Polychlorinated Biphenyls (PCB) removal, handling and disposal.
Routine maintenance activity as defined by DOE NEPA regulations.
Communications and electronic equipment installation, repair and maintenance.
Electrical substation construction or modification.
Electrical transmission line relocation.
Leasing and oversight of grazing activities.
Waste collection and waste treatment facility construction, operation and maintenance.
Crude oil sludge and contaminated soils handling activities including: <ul style="list-style-type: none"> a) Storage; b) Transportation; c) Centrifuge; d) Road application; e) Construct a new landfarm or expand the existing landfarm; f) Using biological and chemical accelerators to speed up the decomposition of petroleum contaminated materials; g) Composting; and h) Off-site disposal.
Closure of solid waste disposal facility and NPR-3 industrial landfill, with off-site disposal of solid waste.
Procurement and transportation of drinking water from a regulated municipal water source.
Gas processing plant expansion or modification as required to meet demands. May consist of adding, moving or resizing equipment.
Reclamation of right-of-ways, pits, production facilities, and other abandonment activities.
Installation of a vehicle wash facility with water recycling capability.
Cathodic protection projects including: <ul style="list-style-type: none"> a) Drilling deep bed anode holes; and

b) Installing transformers and electrical lines necessary for operation of an impressed current cathodic protection system.
Installation, operation and maintenance of air quality and meteorological monitoring stations.
Modify existing equipment to reduce emissions.

As outlined in Section 3.2, other EOR techniques that have been considered include gas injection (of carbon dioxide or nitrogen), chemical flooding (surfactants, polymers), thermal methods (in-situ fireflooding), and oil mining. None are viable economic alternatives at present due to high cost and low process performance. Serious operational problems associated with some of these techniques could be encountered. Examples include carbon dioxide corrosion; inert atmospheric safety considerations associated with nitrogen; and air pollutant emissions from high pressure compressors needed to inject carbon dioxide or nitrogen. In-situ combustion, which has been tried as a pilot project at NPR-3, presents safety considerations, including operation of pressurized oxygen and nitrogen injection systems. Implementation of any of these EOR technology alternatives would require the same amount of land disturbance (and cultural resources impact) as would implementation of the EOR technologies under the Proposed Action.

2.2.2 Divestiture of NPR-3

All Naval Petroleum Reserves are the property of the United States and, pursuant to Public Law 95-91, are operated under authority delegated to DOE. Therefore, any change in ownership or management must be specifically authorized by Congress through legislation. In 1988, the Administration submitted legislation to Congress requesting authorization to sell the government's ownership interest in NPR-3 (and also the larger Naval Petroleum Reserve No. 1 in California). DOE prepared an EA (DOE/EA-0334) that analyzed the difference in the environmental and socioeconomic impacts of the development and operation of NPR-3 that would be caused by changing ownership from the public to the private sector. A Finding of No Significant Impact (FONSI) was prepared for the proposal to sell NPR-3.

Subsequent to publication and distribution of the aforementioned EA, no further consideration had been given to the proposal to sell the Federal government's ownership interest in NPR-3. Public ownership and management of NPR-3 are expected to continue for the next few years because the NEPA review of such a proposal would need to be repeated and none of the required legislation has been proposed.

If NPR-3 were sold to a private interest, it would likely be managed as an oilfield in a manner similar to that used by the DOE under the Proposed Action. However, an independent operator may choose to operate NPR-3 as a stripper oilfield and minimize new investment. The potential environmental impacts would basically be similar to, or less than, those under the Proposed Action. On the other hand, an independent operator may be less attentive to environmental protection than DOE, and the net impact is therefore difficult to quantify.

2.2.3 No-Action Alternative

The No-Action Alternative assumes that none of the actions outlined in the Proposed Action would be initiated. Existing wells and facilities would continue to be operated on a well-by-well basis until the costs to lift a barrel of oil exceed the revenue gained. Implementation of the No-Action Alternative would not be consistent with the statutory mandate to produce NPR-3 at MER.

Plugging and abandonment of wells, an on-going project, and shutdown and rehabilitation of battery sites would be accelerated under the No-Action Alternative. There would also be a reduction in work force as the project changes pace from an aggressive production mode, to a remediation mode, and finally, to a caretaker.

Impact on cultural resources would be minimal, since no new development requiring construction or excavation would

occur.

At some point after steam is stopped, produced water would become minimal and the Water Treatment Facility would be scaled down. Also, some of the three Crow Mountain disposal wells would no longer be needed and would be plugged. Steam generators would also be phased out gradually, decommissioned and salvaged.

With the resultant decline in production, the economics of operating NPR-3 would necessitate a substantial reduction of the current DOE and operating contractor staffs. Area socioeconomics would be adversely impacted since many DOE, operating contractor, and support group employees and their families would have to leave Natrona County to find work. There would be no additional new disturbed acreage, resulting in slightly lower levels of fugitive dust and less disturbance of natural habitat. Roads and facilities would be reclaimed to natural habitat as wells became uneconomical to continue production.

2.2.4 Decommissioning Alternative

Under this alternative, NPR-3 would cease production and begin environmental restoration. The abandonment of the project while it is still economic to operate would result in negative socioeconomic impact to DOE staff, contractor staff, and to Natrona County.

The level of activity would remain relatively high for several years while restoration and decommissioning occurs, but would cease at the completion of remedial action.

Negative impact to wetlands would be substantial, since most wetland areas at NPR-3 would dry up as produced water discharge ceased.

Finally, this alternative would result in the least impact to land and cultural resources because no new disturbance or construction would occur.

3.0 AFFECTED ENVIRONMENT

3.1 Land Resources

3.1.1 Land Use

The principal land use of Natrona County (5,300 square miles or 13,700 square km) is sheep and cattle ranching. Areas adjacent to the NPR-3 are utilized primarily for oil production, with limited livestock grazing. Under the Zoning Ordinance of Natrona County, these lands are zoned RF (Ranching and Farming) although mineral extraction activities are exempt from the Zoning Resolution (Natrona County, 1978). No residential development is currently present or proposed for the immediate area surrounding NPR-3 (Halliburton NUS, 1993), especially because of the lack of potable water.

Land at NPR-3 is utilized primarily for oil production. The land surface is characterized by prairie with occasional sagebrush, severely cut ravines, and sandstone bluffs. Although formerly utilized for livestock grazing, leasing of NPR-3 lands for grazing had been discontinued. This practice would be resumed under the Proposed Action. Developed features in NPR-3 include gravel and dirt roads, wellheads and pumping units, oil and gas production facilities and equipment, storage areas, and an office complex. Existing well locations, shown in Figure 3-1, are concentrated in a 2,500-acre (1,000 ha) area located in the center of NPR-3, with substantially less development taking place in the northern and southern portions of the site. Most wells are located within the basin and at a considerable distance from the surrounding bluffs. Several wells in the extreme southern portion of NPR-3 are located near steeper slopes. Existing roads and facility locations, similarly concentrated in the center of NPR-3, are depicted in Figure 3-2.

Construction of facilities and supporting infrastructure requirements from 1915 to 1989 has resulted in the disturbance of approximately 1,623 acres (657 ha), approximately 17% of the total acreage of NPR-3. As of 1990, approximately

939 of these disturbed acres (380 ha) had been reclaimed (revegetated) and the other 684 acres (277 ha) were required to support ongoing production operations (DOE, 1990). Between 1990 and the present, additional construction of wells, roads and pipelines have disturbed approximately 100 additional acres, although 80 acres of previous wellsites and roads have been reclaimed.

3.1.2 Aesthetics

NPR-3 is typical of much of the central portion of Wyoming. It consists of rolling terrain covered with native grass and sagebrush, and is fragmented by numerous small gullies. NPR-3 is surrounded by a rim of sandstone bluffs. Although portions of NPR-3 operations are visible from the north along Wyoming Route 259, bluffs to the south, east and west generally isolate NPR-3 visually from the public (Halliburton NUS, 1993). The southern-most end of this rim does provide a scenic view of the entire project, although this viewpoint is limited to NPR-3 employees and a few local ranchers (DOE, 1990). Oilfield structures and activities associated with NPR-3 operations are aesthetically consistent and a common visual feature of offsite conditions.

Much of the area inside the sandstone bluffs at NPR-3 has already been altered to some degree by installation of facilities and service roads since operations first began in the 1920s, and since full scale development (at MER) was ordered in 1976.

3.1.3 Recreation

There are no public recreation facilities in the immediate vicinity of NPR-3, and no areas within NPR-3 are open to public recreation (Halliburton NUS, 1993). The nearest public recreation facility to NPR-3 is the Moses Ballfield, located approximately 7 miles (11 km) north near the town of Midwest. Additional recreational facilities maintained within Natrona County include several county parks, reservoirs, and recreation areas. These offer a large variety of activities including picnicking, camping, fishing, boating, swimming, and hiking (Natrona County, 1978).

3.2 Air Quality and Acoustics

3.2.1 Meteorology and Climate

The climate of NPR-3 is characterized as semi-arid with approximately 9-12 inches (23 - 30 cm) of precipitation annually. Precipitation is seldom sufficiently abundant and evenly distributed to keep the soil moist throughout the entire summer. Typical high temperatures in the summer are 80-85°F (27-30°C), and low temperatures in the winter are around 0°F (-18°C). However, extreme temperatures could reach 100°F (38°C) in summer and -40°F (-40°C) in winter. Winds are usually westerly or southwesterly and are most predominant during the late fall and spring months. (FD Services, 1992a)

3.2.2 Air Quality

NPR-3 is located in Natrona County, Wyoming, which is part of the Casper Intrastate Air Quality Control Region (AQCR)(40 CFR 81.213), designated as being in attainment by the EPA for all criteria pollutants (40 CFR 81.351). An ambient air quality monitoring program at NPR-3 was established to monitor air quality parameters set forth by the Wyoming Department of Environmental Quality (WYDEQ), Division of Air Quality, and as recommended by the June 1989 Environmental Survey Team. Ambient air quality meets State of Wyoming standards at the perimeter of the property (FD Services, 1992a). The air quality program includes ambient air monitoring for H₂S, nitrogen oxides (NO_x) and hydrocarbons. In order to address worker health and safety, H₂S sampling has been conducted in the areas of highest potential concentrations (FD Services, 1992a). The primary areas associated with elevated H₂S levels include facilities in the steamflood patterns, the main ones being T-5-3, T-5-10, and B-3-3/T-4-3 tank batteries (FD Services, 1992b).

Prior to the NPR-3 studies, ambient air quality data for Natrona County generally, and NPR-3 specifically, were limited. Data prior to 1976 indicate that background levels of suspended particulates in the area ranged from 20 to 30 mg/m³. No values for hydrocarbons were available for Natrona County. However, hydrocarbon sampling done in Converse County (adjacent to Natrona County) revealed that background levels there were apparently exceeding current state standards. Levels of H₂S measured on NPR-3 in June 1976 were less than 4 ppm.

From July 1 through December 31, 1981, ambient air monitoring for total suspended particulates (TSP), sulfur dioxide (SO₂), nitrogen dioxide (NO₂) and hydrogen sulfide (H₂S) was done to establish background levels of the above parameters and to monitor emissions associated with the Fireflood Pilot Project which was initiated at NPR-3 in 1982. During this period, the sampling results for TSP, SO₂, NO₂ and H₂S were lower than the annual regulated standard. Additional ambient air monitoring for TSP, SO₂, H₂S, and NO₂ was also conducted between July 1982 and March 1983. During this period the sampling results for hydrocarbons, TSP, NO₂, and SO₂ were also less than the annual standard. (DOE, 1990)

In August 1986 the annuli between the casing and tubing on various steamflood wells were sampled for H₂S. Prior to steam injection these wells did not produce H₂S. As the steam front spread through the formation, the growth of anaerobic sulfate-reducing bacteria was stimulated, resulting in the formation of the gas. H₂S levels were stabilized by means of chemical treatment of the wells with biocides. (DOE, 1990)

Further sampling of ambient H₂S, ozone, PM-10 and hydrocarbons occurred in 1989. Again, sampling results, indicated that PM-10, ozone and H₂S levels were less than the standard. (DOE, 1990)

[Table 3-1](#) lists the NPR-3 facilities currently operating under air quality permits issued by the Wyoming Department of Environmental Quality and their respective emission inventories for calendar year 1993.

The permitting and operation of Steam Generator #5 in January 1993 increased the potential emissions of nitrogen oxides (NO_x) (including NO₂) at NPR-3 to levels exceeding the 100 tons (102 metric tons) per year threshold for a major source. (Khatib, 1993a) Because of NPR-3's major source status, a Title V Operating Permit application is currently being prepared for NPR-3 by a consulting firm.

3.2.3 Acoustics

The major noise sources within NPR-3 include various facilities, equipment and machines (steam generators, engines, pumps, drilling rigs, vehicles, etc.). Buildings associated with the North Waterflood, Water Disposal Facility, and all steam generators have been identified as having inside noise levels exceeding 85 decibels, and hearing protection is required for workers within these areas (FD Services, 1992b). Although sound-level monitoring of ambient acoustic conditions at NPR-3 has not been conducted, the contribution from NPR-3 operations to ambient noise levels beyond the Reserve boundary is estimated to be minimal, and no residences are located within audible range of general operations.

Table 3-1 Permitted Air Quality Emission Sources at NPR-3

		1993	Emissions	Data	
Source	Permit Number	Particulate Matter	Sulfur Dioxide	Nitrogen Oxide	Carbon Monoxide
Gas Plant Heater	CT-360	0.32 x 10 ⁻⁴ lb/hr -4	3.9 x 10 ⁻⁶ lb/hr -5	0.64 x 10 ⁻³ lb/hr	1.3 x 10 ⁻⁴ lb/hr

		1.4 x 10 tpy ^a	1.7 x 10 tpy	2.8 x 10 ⁻³ tpy	5.6 x 10 ⁻⁴ tpy
Gas Plant Smokeless Flare	CT-361A	b	b	b	b
Steam Generator No. 1	CT-361A- 2	0.219 lb/hr 0.94 tpy	0.013 lb/hr 0.05 tpy	1.50 lb/hr 6.42 tpy	b
Steam Generator No. 2	CT-778	0.208 lb/hr 0.878 tpy	0.030 lb/hr 0.12 tpy	10.13 lb/hr 21.46 tpy	b
Steam Generator No. 3	CT-850	b	b	b	b
Steam Generator No. 4	CT-874	b	b	4.49 lb/hr 19.66 tpy	b
Steam Generator No. 5	CT-937	c	c	4.49 lb/hr 19.66 tpy	c

^a tpy = Metric tons per year Source: 1993 Emissions Inventory Report for Criteria Pollutants

^b Facility was not tested at NPR-3, submitted by FD to WYDEQ

^c Began operation in 1993 on 3-28-94.

3.3 Water Resources

3.3.1 Surface Water Quantity

NPR-3 is drained by a series of ephemeral or intermittent stream channels that flow through steep topographic swales, locally referred to as draws. Little Teapot Creek originates in the highlands south of NPR-3 and enters NPR-3 in a northerly direction across the southern boundary as an intermittent stream. Teapot Creek originates approximately 15 miles (24 km) southwest of NPR-3 and enters NPR-3 in an easterly direction across the northwestern boundary as an intermittent stream. All other ephemeral and intermittent streams on NPR-3 drain into Little Teapot or Teapot Creeks. Little Teapot and Teapot Creeks merge immediately south of NPR-3's northern boundary and exit NPR-3 in a northerly direction. The merged stream flows into Salt Creek less than 1 mile (1.6 km) north of NPR-3, which flows to the Powder River, approximately 25 miles (40 km) to the north. (USGS, 1974)

Several small impoundments, none larger than 10 acres (4 ha) in surface area, had been constructed in the draws to serve as reservoirs during earlier operations on NPR-3 in the 1920s (Halliburton NUS, 1993). The remains of several of these impoundments still exist, but the basins only support wetlands.

Produced water obtained from the Tensleep and Madison formations is discharged to Little Teapot Creek and its tributaries through 14 outfalls. Discharges through each outfall are regulated under NPDES permits issued by WYDEQ,

Water Quality Division. Although many of the outfalls are presently inactive, and discharges through some outfalls are only sporadic, discharge through other outfalls is continuous, resulting in perennial flow in Little Teapot Creek. (DOE, 1990) Discharge under any necessary general stormwater discharge permits would not be expected to make a contribution to surface flows.

Current operations at NPR-3 do not involve the withdrawal of any surface water from the streams or ponds.

3.3.2 Ground Water Quantity

There are no high quality fresh water aquifers in the strata underlying NPR-3. Those strata that produce fluids either produce water with excessive levels of total dissolved solids (TDS) or a mixture of hydrocarbons and water. The Steele Shale formation occupies the interval from the surface to an approximate depth of 2,000 feet (610 m). There are two porous and permeable sandstone formations within the Steele Shale. The Sussex sandstone outcrops in a ring near the center of the Teapot Dome structure, but does not appear to contain an aquifer. The second sandstone body is the Shannon sandstone which is an oil reservoir in much of the field. A fault separates the oil reservoir from the Shannon outcrop at Salt Creek to the north. Groundwater is encountered in the Shannon in some areas north of the fault, but the concentration of Total Dissolved Solids exceeds 10,000 mg/l. No Underground Sources of Drinking Water (USDWs) or other shallow fresh water aquifers have been detected in the 795 wells drilled since 1976.

It should be noted that there is a strong distinction at NPR-3 between "fresh water aquifers" and "USDWs". Exempted aquifers are not USDW's under the Safe Drinking Water Act, which permits aquifer exemptions for fresh water aquifers being used for Class II injection. Several such aquifer exemptions exist at NPR-3. In addition, aquifers that contain crude oil, natural gas, or other contaminants that make it undesirable for a water supply could also be exempted. Several other aquifers at NPR-3 qualify for exemption under this criteria, although the actual exemption has not been pursued with the Wyoming Oil & Gas Conservation Commission. Produced water from oil and gas production is put to beneficial use for livestock and wildlife at NPR-3, but there would be no intention to protect it as a source of municipal water supply.

The Madison formation, which could be a high yield, fresh water aquifer, lies below the deepest producing geologic unit within NPR-3 at a depth of below 6,000 feet (1,800 m) but yields water of only fair quality, with a TDS level of approximately 3000 mg/L. (DOE, 1990) The Madison could be considered a USDW, but activities at NPR-3 are not likely to impact this aquifer.

Although not suitable as drinking water, water from the Madison and Tensleep formations (at a depth approximately 5400 feet or 1,600 m from the surface) is utilized to supply make-up water for existing steamflooding and waterflooding EOR activities at NPR-3. (Fosdick, 1992b)

3.3.3 Surface Water Quality

The effluent limits from each National Pollutant Discharge Elimination System (NPDES) permit under which water is discharged to the draws at NPR-3 are listed in Table 3-2. The DOE submits semi-annual Discharge Monitoring Reports to the WYDEQ. Samples are taken bimonthly to monitor discharge water quality. (DOE, 1990; Dunn, 1993)

Water is discharged in large quantities only from the Tensleep Battery (B-TP-10) (NPDES Permit WY-0028274). The other NPDES permits listed in Table 3-2 are either inactive, represent highly occasional discharges, or represent discharges of very small quantities of effluent. Water discharged from the Tensleep Battery is formation water produced with the Tensleep oil. Although the natural temperature of water at the time of withdrawal from Tensleep formation is 180°F (82°C), temperatures of the effluent are typically under 100°F (38°C) (Doyle, 1993). Because the streams are generally less than 1 foot (0.3 m) deep, the elevated temperatures at the point-of-discharge rapidly diminish to ambient levels through atmospheric cooling.

The WYDEQ has determined that the streams at NPR-3 are all Category IV streams (Doyle, 1993). Category IV streams are defined in the Wyoming Water Standards as "surface waters, other than those classified as Class I, which

are determined by the Wyoming Game and Fish Department not to have the hydrologic or natural water quality potential to support fish". Thermal effluent limits are not established by the WYDEQ for NPDES Permits for discharges to Class IV streams.

3.3.4 Ground Water Quality

Groundwater produced with crude oil and natural gas is disposed underground by injection into the Crow Mountain formation. The water treatment plant softener regeneration water is also injected into a disposal well. These wells are permitted through EPA's Underground Injection Control (UIC) program, which is managed by the Wyoming Oil and Gas Conservation Commission. Geologic formations that receive injected water also have an aquifer exemption authorized by the Oil and Gas Conservation Commission, which has primacy for regulating class II injection wells under the Safe Drinking Water Act.

3.3.5 Potable Water

Because there are no potable water wells in the vicinity of NPR-3, all potable water must be trucked to NPR-3 from either the city of Casper or the town of Midwest. Both supplies are community water systems and have been approved by the EPA as drinking water systems. Drinking water samples are taken quarterly at NPR-3 to monitor for coliform and confluent bacteria. Samples are analyzed by the Natrona County Health Department. A copy of the analytical results is retained by the Contractor's Environmental Department and a copy is sent by the Natrona County Health Department to the EPA Region VIII (DOE, 1990). Sampling is also conducted for lead and copper levels as required by the Lead and Copper Rule.

Table 3-2 Summary of NPDES Permit Limits

Permit Number	Name of Source	Oil and Grease ¹	Specific Conductance ²	COD ³
WY-0028274	B-TP-10 Tank Battery	10	N/A	N/A
WY-0034126	North Waterflood Floor Drains	10	7500	100
WY-0031895	North Waterflood	10	N/A	N/A
WY-0028894	Tank Battery B-1-3	10	N/A	N/A
WY-0028908	Tank Battery B-1-10	10	N/A	N/A
WY-0028932	Tank Battery B-2-10	10	N/A	N/A
WY-0028916	Tank Battery B-1-28	10	N/A	N/A
WY-0028924	Tank Battery B-1-33	10	N/A	N/A
WY-0034037	Water Treatment Facility	10	7500	100
WY-0032115	Water Disposal Facility	10	N/A	N/A
WY-0034029	Steam Generator 2	10	7500	100
WY-0034495	Steam Generator 3	10	7500	100

WY-0035076	Steam Generator 4	10	7500	100
WY-0035297	Steam Generator 5 ⁴	10	7500	100

¹ In mg/l, daily maximum

² In umhos/cm, daily maximum

³ In mg/l, daily maximum

⁴ Additional limits are set for pH (minimum of 6.5 and maximum of 8.5) and flow in conduit or through treatment plant (30 mgd, as daily maximum or 30-day average)

3.4 Geology, Soils, and Prime and Unique Farmlands

3.4.1 Geology

NPR-3 is centered over the crestal axis of an asymmetrical doubly-plunging anticline called the Teapot Dome, which is the southern extension of the much larger Salt Creek anticline. The Salt Creek anticline underlies the prolific Salt Creek Oilfield, located to the north of NPR-3. (DOE, 1990)

The geologic column for the Teapot Dome is shown in Figure 3-3. The oil productive horizons are the Shannon, Steele Shale, Niobrara Shale, Second Wall Creek, Third Wall Creek, Muddy, Dakota, Lakota, and Tensleep formations. Formations currently undergoing enhanced oil recovery (EOR) operations include the Shannon and Second Wall Creek sands and the Muddy formation.

The topography of the region surrounding NPR-3 is characterized by rolling plains interspersed with ridges and isolated bluffs. The central part of NPR-3 consists of a large plain, dissected by ravines (draws), that is encircled to the east, west, and south by a rim of sandstone (U.S. Navy, 1976). The area surrounding NPR-3 is not known to be seismically active (Halliburton NUS, 1993).

3.4.2 Soils

The USDA Soil Conservation Service (SCS) has completed a Class III soil survey of portions of Natrona County, including NPR-3 and surrounding lands. Soil survey mapping units covering NPR-3 are outlined in Figure 3-4. Map pages from the soil survey covering NPR-3 are provided in Table 3-3. Soils throughout NPR-3 are largely derived from sodic (alkaline) parent materials and are highly alkaline and saline. The high salinity of soils on NPR-3 is limiting to plant growth. All soils on NPR-3 are well drained. Most soils on NPR-3 are highly or moderately susceptible to erosion caused by heavy downpours (Davis, 1993a).

Most upland soils throughout all parts of NPR-3 other than the peripheral ridges are mapped as Cadoma-Renohill-Samday clay loams. The Cadoma soil series is typically found on hillsides of 3 to 12 percent slope, the Renohill soil series is typically found in swales of 3 to 6 percent slope, and the Samday soil series is typically found on ridges of 3 to 12 percent slopes. These soils are derived from slopewash alluvium and residuum derived dominantly from sodic (alkaline) shale. The Cadoma and Renohill soils are moderately deep and well drained, while the Samday soils are shallow and well drained. All of these soils are highly susceptible to water erosion. (Davis, 1993a)

Scattered areas of upland soils are mapped under other names and comprise soils mapped in other soil series. Most of these other upland soils are also derived from sodic (alkaline) materials. All are well drained but differ widely in their susceptibility to water erosion (Davis, 1993a). Soils in the major draws on NPR-3 are mapped in the Haverdad-Clarkelen complex, a mosaic of soils in the Haverdad series (Haverdad loam) and the Clarkelen series (Clarkelen sandy loam). The Haverdad and Clarkelen soils are very deep and well drained, and they are only slightly susceptible

to water erosion. (Davis, 1993a)

Table 3-3 Soil Survey Mapping Units

Map Unit 112: Arvada-Absted-Slickspots complex, 0 to 6 percent slopes

Location on NPR-3: Scattered upland areas throughout all parts of the reserve except for the bluffs.

Composition: 35% Arvada clay loam; 30% Absted clay loam; and 15% Slickspots.

Origin: Alluvium derived dominantly from sodic shale (Arvada and Absted soils).

Drainage: Well drained (Arvada and Absted soils).

Hazard of Water Erosion: Slight (Arvada and Absted).

Capability Subclass: VIs (Arvada and Absted soils)

Map Unit 113: Arvada, runon-Slickspots complex, 0 to 3 percent slopes

Location on NPR-3: Isolated upland area in the northern part of the reserve.

Composition: 60% Arvada loam, overflow and 25% Slickspots.

Origin: Alluvium derived dominantly from sodic shale (Arvada soil).

Drainage: Well drained (Arvada soil).

Hazard of Water Erosion: Slight (Arvada soil).

Capability Subclass: VIs (Arvada soil).

Map Unit 125: Blackdraw-Lolite-Gullied land complex, 3 to 20 percent slopes

Location on NPR-3: Scattered upland areas in the northern part of the reserve.

Composition: 45% Blackdraw clay loam; 20% Lolite clay loam; and 20% gullied land.

Origin: Slopewash alluvium and residuum derived dominantly from noncalcareous sodic shale (Blackdraw soil); residuum derived dominantly from noncalcareous sodic shale (Lolite soil).

Drainage: Well drained (Blackdraw and Lolite soils).

Hazard of Water Erosion: Severe (Blackdraw and Lolite soils)

Capability Subclass: VIe (Blackdraw soil); VIIe (Lolite soil).

Map Unit 134: Bowbac-Taluce-Terro complex, 6 to 20 percent slopes

Location on NPR-3: Scattered upland areas in the northern part of the reserve.

Composition: 40% Bowbac sandy loam; 25% Taluce sandy loam; and 15% Terro fine sandy loam.

Origin: Slopewash alluvium and residuum derived dominantly from sandstone (Bowbac soil); residuum derived dominantly from sandstone (Taluce soil); alluvium derived dominantly from sandstone (Terro soil).

Drainage: Well drained.

Hazard of Water Erosion: Moderate (Bowbac and Terro soils); High (Taluce soil)

Capability Subclass: IVe (Bowbac and Terro soils); VIIe (Taluce soil).

Map Unit 140: Cadoma-Renohill-Samday clay loams, 3 to 12 percent slopes

Location on NPR-3: Characteristic soil on the uplands throughout all parts of the reserve except for the bluffs.

Composition: 40% Cadoma clay loam; 25% Renohill clay loam; and 25% Samday clay loam.

Origin: Slopewash alluvium and residuum derived dominantly from sodic shale (Cadoma and Renohill soils).

Drainage: Well drained.

Hazard of Water Erosion: Severe.

Capability Subclass: VIe (Cadoma soil); IVe (Renohill soil); VIIe (Samday soil).

Map Unit 195: Haverdad-Clarkelen complex, saline, 0 to 3 percent slopes

Location on NPR-3: Characteristic soil within the larger draws throughout all parts of the reserve.

Composition: 50% Haverdad loam, saline and 35% Clarkelen sandy loam, saline

Origin: Stratified alluvium from mixed sources.

Drainage: Well drained.

Hazard of Water Erosion: Slight.

Capability Subclass: IVs - irrigated; VIs - nonirrigated.

Map Unit 208: Kayner sandy clay loam, 3 to 10 percent slopes

Location on NPR-3: Characteristic soil on the high ground at the foot of the bluffs near the eastern, western, and southern boundaries.

Composition: Over 80% of this map unit is Kayner sandy clay loam.

Origin: Alluvium derived dominantly from sodic sandstone and shale.

Drainage: Well drained.

Hazard of Water Erosion: Moderate.

Capability Subclass: VIe.

Map Unit 209: Keyner-Absted-Slickspots complex, 0 to 6 percent slopes

Location on NPR-3: Small, isolated area of uplands near the western boundary.

Composition: 50% Keyner sandy loam; 20% Absted sandy clay loam; and 15% slickspots.

Origin: Alkaline alluvium derived from mixed sources (Keyner soil); alluvium derived dominantly from sodic shale (Absted soil).

Drainage: Well drained.

Hazard of Water Erosion: Slight (Keyner and Absted soils).

Capability Subclass: No information.

Map Unit 214: Lolite-Rock outcrop complex, 10 to 40 percent slopes

Location on NPR-3: Small, scattered areas of uplands in the northern part of the reserve.

Composition: 60% Lolite clay and 20% Rock outcrop.

Origin: Residuum derived dominantly from sodic shale (Lolite soil).

Drainage: Well Drained.

Hazard of Water Erosion: Severe (Lolite soil).

Capability Subclass: VIIe.

Map Unit 215: Lolite, dry-Rock outcrop, 5 to 50 percent slopes

Location on NPR-3: Isolated area of uplands near the interior of NPR-3.

Composition: 50% Lolite clay, dry and 30% Rock outcrop.

Origin: Residuum derived dominantly from noncalcareous, sodic shale (Lolite soil).

Drainage: Well drained (Lolite soil).

Hazard of Water Erosion: High (Lolite soil).

Capability subclass: VIIe (Lolite soil).

Map Unit 256: Rock outcrop-Ustic torriorthents, shallow-Rubble land complex, 30 to 100 percent slopes

Location on NPR-3: Characteristic soil on the bluffs near the eastern, western, and southern boundaries.

Composition: 40% Rock outcrop; 25% Ustic torriorthents, shallow; and 15% Rubble land

Drainage: Well to excessively well drained (Ustic torriorthents).

Hazard of Water Erosion: Moderate to severe. (Ustic torriorthents)

Capability Subclass: VIII.

Map Unit 278: Silhouette-Petrie clay loams, 1 to 6 percent slopes

Location on NPR-3: Small upland area in northwestern corner.

Composition: 50% Silhouette clay loam and 30% Petrie clay loam

Origin: Alluvium derived dominantly from shale (Silhouette soil); alluvium derived dominantly from sodic shale (Petrie soil).

Drainage: Well drained.

Hazard of Water Erosion: Moderate.

Capability Subclass: VIII.

Map Unit 283: Theedle-Shingle-Kishona complex, 6 to 40 percent slopes, gullied

Location on NPR-3: Small area on extreme west-central periphery

Composition: 30% Theedle clay loam, 25% Single loam, and 20% Kishona clay loam

Origin: Slopewash alluvium and residuum derived dominantly from sedimentary rocks

Drainage: Well drained.

Hazard of Water Erosion: High (Theedle and Single soils); Moderate (Kishona soil)

Capability Subclass: VIe (Theedle and Kishona soils); VIIe (Shingle soil)

Higher elevation lands approaching the peripheral ridges are mapped as Keyner sandy clay loam. These soils are deep and well drained. The hazard of water erosion is moderate. Soils on and immediately at the base of the bluffs are mapped in the Rock outcrop-Ustic Torriorthents, shallow-Rubble land complex. These areas are characterized by exposed rock, colluvial boulders, and shallow soil. (Davis, 1993a)

3.4.3 Prime and Unique Farmlands

The SCS does not presently recognize any prime or unique farmlands or farmlands of local importance within the boundaries of NPR-3 (Davis, 1993b). All soils on NPR-3 are mapped in Capability Classes IV or higher, and the majority are mapped in Capability Classes VI and higher (Davis, 1993a). The SCS defines Class IV soils as soils that have very severe limitations that reduce the choice of plants or that require very careful management, or both. The SCS defines Class VI soils as soils having severe limitations that make them unsuitable for cultivation. In general, soils in the highest numbered Capability Classes are less suitable for cultivation than soils in the lowest numbered Capability Classes.

3.5 Biological Resources

3.5.1 Aquatic Biology

Aquatic habitats at NPR-3 are limited to intermittent streams within the draws, shallow perennial streams fed primarily by produced water discharged under NPDES permits, and man-made ponds. Fish have not previously been reported in the draws on NPR-3 (DOE, 1990). The Wyoming Game and Fish Department (WGFD) stocked fingerling (5 to 6 inch/14 cm) rainbow trout in two of the abandoned impoundments at NPR-3 between 1987 and 1989. Water in one of the impoundments comprises run-off from snow melt and rain, and water in the other comprises produced water originating from the Madison formation on an adjoining privately owned oilfield. One year later, the trout in the second pond had grown to 11-14 inches (28-36 cm) in length, while the first pond dried up. The following year, they had reached a length of approximately 18 inches (46 cm) (DOE, 1990).

A fish survey of the surface waters on NPR-3 has not been conducted. NPR-3 lies within the geographic range of approximately 17 fish species. Although only a few of these species (such as creek chub or killifish) would be expected in streams onsite, NPR-3 is within the watershed of the Powder River, which may contain most of these species (Page and Burr, 1991).

3.5.2 Terrestrial Vegetation

NPR-3 is located in part of North America where vegetation is characterized by shortgrass prairie. The last vegetation survey of NPR-3, performed prior to intensive development of the Reserve by the DOE in 1978, identified six major vegetation associations (Figure 3-5). These include three rangeland associations on the upland plains, two riparian associations in the bottoms of the draws, and a pine-juniper association on the peripheral ridges. (U.S. Navy, 1976)

Much of the rangeland vegetation has been physically disturbed by construction of wells, drill pads, access roads, and other DOE activity since 1978. Disturbance is generally continuous throughout certain areas of intensive activity in the center of the Reserve east of the office and warehouse complexes. Disturbance elsewhere is generally localized around scattered wells and other work areas. The pine-juniper vegetation on the peripheral ridges has not generally been disturbed by DOE operations since 1978. Except at a few road crossings, riparian vegetation in the draws has not generally been physically disturbed by DOE operations. However, riparian vegetation downstream of NPDES-permitted points of discharge has experienced increased water flows and increased water temperatures. (Halliburton NUS, 1993)

The DOE reclaims and reseeds drill pads, flowline rights-of-way, and abandoned well sites on NPR-3, using guidelines provided by the SCS (SCS, 1992). The reseeded areas provide browse for the larger mammals, habitat for

smaller animals, and reduce water and wind erosion.

The DOE does not presently lease any of the rangeland within NPR-3 for grazing, although this would be part of the Proposed Action. The last grazing lease terminated in 1986 (Doyle, 1993). Prior to that time, rangeland within NPR-3 was overgrazed (Young, 1986; Watson, 1987). Between 1981 and 1986, grazing on NPR-3 exceeded 2,000 animal unit-months (AUM), whereas the Soil Conservation Service had recommended in 1965 that grazing on NPR-3 not exceed 1,185 AUM (Watson, 1987).

Trees at NPR-3 are largely limited to piñon pine, ponderosa pine, and juniper within small zones of pine-juniper forests on the peripheral ridges, and to a few cottonwood trees among the riparian vegetation in the draws (DOE, 1990). Except for the peripheral ridges, uplands throughout NPR-3 lack trees. No land on NPR-3 is managed for timber production (Doyle, 1993).

During the summer of 1987, and spring of 1988, a pilot project was initiated to introduce narrow leaf cottonwood (*Populus angustifolia*) and Russian olive (*Eleagnus angustifolia*) trees to NPR-3. Both species are hardy and were expected to adapt to the dry summers and cold winters. Four hundred and fifty cottonwood trees, Russian olive trees, and willow (*Salix* sp.) shrubs were planted along streams and ponds on the Reserve. Due to drought conditions that occurred during these years and damage done by wildlife, few of the trees survived (DOE, 1990). This project may be tried again, but using indigenous species to increase the probability of success.

3.5.3 Terrestrial Wildlife

The Wyoming Game and Fish Department (WGFD) maintains a database (Wildlife Observation System) of wildlife sightings throughout the state by township, range, and section. A list of species recorded in the database for those townships and ranges in the immediate vicinity of NPR-3 is provided in Table 3-4. This list also includes several other species which have been observed over the years on NPR-3 by the DOE staff and its contractors (US Navy, 1976; Stark, 1993). This does not represent a systematic inventory of terrestrial wildlife known to occur on NPR-3. According to a bird and mammal distributive study for Wyoming, approximately 222 bird species and 49 mammal species have been observed in the region containing the NPR-3 site (WGFD, 1991). NPR-3 lies within the geographic range with at least 6 amphibians and 9 reptile species (Stebbins, 1985). Table 3-4 indicates recorded observations of 3 amphibian, 4 reptile, 61 bird, and 20 mammal species at NPR-3.

Pronghorn antelope and mule deer are the principal big game mammals seen at NPR-3 (DOE, 1990). The DOE does not presently allow any hunting on NPR-3 (Doyle, 1993). NPR-3 does not contain any Critical Winter Range for either antelope or deer. Range within NPR-3 is classified by the WGFD as Winter Year-Long Range for both species. The range is utilized by both species throughout the year but is not depended upon during the winter by transient deer or antelope populations that reside elsewhere during the growing season (Thiele, 1993).

Other characteristic mammal species of NPR-3 include: raccoons, striped skunk, porcupine, badger, fox, bobcat, prairie dog (three known colonies), cotton-tail rabbit, and deer mouse. Apparently common species among the variety of birds found at NPR-3 are the red-tailed hawk, American kestrel, golden eagle, horned lark, western meadowlark, Brewer's blackbird, vesper sparrow, Brewer's sparrow, lark bunting, and sage thrasher. Characteristic amphibians and reptiles found on NPR-3 include: toad species, sagebrush lizard, short-horned lizard, garter snake, and western rattlesnake (DOE, 1990; WGFD, 1991; WGFD, 1993).

3.5.4 Threatened and Endangered Species

The offices of the U.S. Fish and Wildlife Service (FWS) and the WGFD, both in Cheyenne, Wyoming, and the Nature Conservancy in Laramie, Wyoming, were consulted to determine which federally and/or state listed threatened, endangered, or candidate species or critical habitats could potentially occur at NPR-3.

In a letter dated January 14, 1993, (attached) the FWS indicated that several of the species shown in Table 3-5 could be present in the area of NPR-3. According to the FWS, the black-footed ferret (Federally-listed endangered) could inhabit prairie dog towns in the vicinity of NPR-3 (Davis, C. P., 1993). Three prairie dog colonies, each less than 100

acres (40 ha) in area, are known to occur near the eastern and southern boundaries of NPR-3 on rangeland that is undisturbed by present oil drilling operations (Stark, 1993). Two of these colonies are large enough to potentially support the black-footed ferret. No evidence of the black-footed ferret was found during an earlier survey conducted in 1986 (DOE, 1990).

The FWS also indicated that the bald eagle (Federally-listed endangered) could be a winter resident or a migrant to the area of NPR-3 and that the peregrine falcon (Federally-listed endangered) could be a migrant to the area (Davis, C. P., 1993). An adult bald eagle has been observed perched on the bluffs immediately west of the administration building on NPR-3 (Soehn, 1993). There are no known bald eagle or peregrine falcon nests in the vicinity of NPR-3. The closest known bald eagle nests to NPR-3 are on the Platte River east of Glenrock and in Ednes Kimball Wilkens Park in Casper (Thiele, 1993).

The FWS identified several federal candidate species which potentially occur in the vicinity of NPR-3 (Table 3-5). The FWS is especially interested in the narrow-foot hygrotus diving beetle, which is currently known only from Dugout, Cloud, and Dead Horse Creeks, all intermittent streams in draws within a 25-mile (40-km) radius of NPR-3. (Davis, C. P., 1993; Leech, 1966)

The loggerhead shrike (Category 2) has been observed at NPR-3 and is a known breeder in the region. The ferruginous hawk (Category 2) is also a known breeder and year-round resident to the region. Suitable habitat exists at NPR-3, but there are no documented occurrences. The white faced ibis and black tern (both Category 2) have been observed within the region, but there is very little suitable habitat at NPR-3 to attract these species. The mountain plover (Category 1) has also been observed in the region but it is not known to breed in the region. Although suitable habitat exists NPR-3, this species has not been observed. (WGFD, 1992)

There are no known threatened, endangered or other special status fish species known to occur at NPR-3. The Powder River provides important habitat for the sturgeon chub (Category 2) and the shovelnose sturgeon, both considered to be "Sensitive Species" in Wyoming. (Collins, 1993)

The Nature Conservancy maintains the Wyoming Natural Diversity Data Base (WNDDDB), a data base of species sightings recorded by township, range, and section. The WNDDDB has no records of threatened or endangered species within Townships 37 - 40N or Ranges 77 - 79W; which constitute the area within and immediately surrounding the NPR-3 site (Neighbours, 1993). The WNDDDB does contain two records of a plant species, Barr's Milkvetch (Category 2), in the area surrounding NPR-3. However, this species has been recommended for downlisting to Category 3 (not appropriate for listing as threatened or endangered) because it has been found to be more common than originally believed. The Barr's Milkvetch generally grows where vegetative cover is sparse, and is thought to prefer a whitish, sandy-silty soil that may be calcareous. (Neighbors, 1993).

Table 3-4 List of Species Recorded in the Vicinity of NPR-3

Common Name	Scientific Name
<u>AMPHIBIANS</u>	
Boreal chorus frog	<i>Pseudacris triseriata malculata</i>
Tiger salamander ^b	<i>Ambystomia tigrinum</i>
Toad sp. ^c	<i>Bufo sp.</i>
<u>REPTILES</u>	
Sagebrush lizard ^b	<i>Sceloporus graciosus</i>
Short-horned lizard ^b	<i>Phrynosoma douglassi</i>
Western terrestrial garter snake ^{bc}	<i>Thamnophis elegans</i>
Western rattlesnake ^{bc}	<i>Crotalis viridis</i>

FISH

Minnow sp.^c

Undetermined species

BIRDS

American robin^a

Turdus migratorius

American kestrel^{ab}

Falco sparverius

American wigeon^{ab}

Anas americana

American avocet^{ac}

Recurvirostra americana

Bald eagle^{ac}

Haliaeetus leucocephalus

Black-billed magpie^{abc}

Pica pica

Blue-winged teal^{ab}

Anas discors

Brewer's blackbird^a

Euphagus cyanocephalus

Brewer's sparrow^{ab}

Spizella breweri

Chukar^a

Alectoris chukar

Cliff swallow^a

Hirundo pyrrhonota

Common poorwill^{ab}

Phalaenoptilus nuttallii

Common nighthawk^a

Chordeiles minor

Common snipe^b

Capella gallinago

Double-crested cormorant^c

Phalacrocorax auritus

European starling^a

Sturnus vulgaris

Gadwall^{ab}

Anas strepera

Golden eagle^{abc}

Aquila chrysaetos

Great horned owl^{ab}

Bubo virginianus

Green-winged teal^{ab}

Anas crecca

Horned lark^{ab}

Eremophila alpestris

House wren^{ab}

Troglodytes aedon

Killdeer^{ab}

Charadrius vociferus

Lark bunting^a

Calamospiza melanocorys

Lark sparrow^b

Chondestes grammacus

Lesser yellowlegs^b

Tringa flavipes

Loggerhead shrike^{abc}

Lanius ludovicianus

Mallard^{bc}

Anas platyrhynchos

McCown's longspur^a

Calcarius mccownii

Mountain bluebird^{ab}

Sialia currucoides

Mourning dove^{ab}

Zenaidura macroura

Northern shrike^a

Lanius excubitor

Northern (red-shafted) flicker^a

Colaptes (cafer) auratus

Northern (yellow-shafted) flicker ^{ab}	<i>Colaptes auratus</i>
Northern harrier ^{ab}	<i>Circus cyaneus</i>
Northern rough-winged swallow ^b	<i>Stelgidopteryx serripennis</i>
Pectoral sandpiper ^b	<i>Calidris melanotos</i>
Pintail ^b	<i>Anas acuta</i>
Pinyon jay ^b	<i>Gymnorhinus cyanocephalus</i>
Plover sp. ^c	<i>Charadrius sp.</i>
Prairie falcon ^{ab}	<i>Falco mexicanus</i>
Red-tailed hawk ^{abc}	<i>Buteo jamaicensis</i>
Red-winged blackbird ^{ab}	<i>Agelaius phoeniceus</i>
Rock wren ^{ab}	<i>Salpinctes obsoletus</i>
Rough-legged hawk ^c	<i>Buteo lagopus</i>
Sage sparrow ^{ab}	<i>Amphispiza belli</i>
Sage grouse ^{ab}	<i>Centrocercus urophasianus</i>
Sage thrasher ^{ab}	<i>Oreoscoptes montanus</i>
Say's phoebe ^{ab}	<i>Sayornis saya</i>
Sharp-shinned hawk ^a	<i>Accipiter striatus</i>
Short-eared owl ^a	<i>Asio flammeus</i>
Spotted sandpiper ^a	<i>Actitis macularia</i>
Swainson's hawk ^{ab}	<i>Buteo swainsoni</i>
Turkey vulture ^a	<i>Cathartes aura</i>
Vesper sparrow ^{ab}	<i>Pooecetes gramineus</i>
Violet-green swallow ^b	<i>Tochycineta thalassina</i>
Western grebe ^c	<i>Aechmophorus occidentalis</i>
Western meadowlark ^{abc}	<i>Sturnella neglecta</i>
Western kingbird ^{ab}	<i>Tyrannus verticalis</i>
White-throated swift ^a	<i>Aeronautes saxatalis</i>
Wilson's phalarope ^a	<i>Phalaropus tricolor</i>

MAMMALS

Black-tailed prairie dog ^a	<i>Cynomys ludovicianus</i>
Bobcat ^{ac}	<i>Lynx rufus</i>
Brush-tailed woodrat ^b	<i>Neotoma cinerea</i>
Coyote ^{bc}	<i>Canis latrans</i>
Deer mouse ^b	<i>Peromyscus maniculatus</i>
Desert cottontail ^b	<i>Sylvilagus auduboni</i>
Eastern cottontail ^a	<i>Sylvilagus floridanus</i>
^b	<i>Eutamias minimus</i>

Least chipmunk	
Mountain lion ^a	<i>Felis concolor</i>
Mountain cottontail ^a	<i>Sylvilagus nuttallii</i>
Mule deer ^{ac}	<i>Odocoileus hemionus</i>
Muskrat ^c	<i>Ondatra zibethica</i>
Northern pocket gopher ^b	<i>Thomomys talpoides</i>
Porcupine ^{bc}	<i>Erethizon dorsatum</i>
Pronghorn ^{ac}	<i>Antilocapra americana</i>
Raccoon ^c	<i>Procyon lotor</i>
Red fox ^{ac}	<i>Vulpes vulpes</i>
Striped skunk ^{bc}	<i>Mephitis mephitis</i>
Swift fox ^b	<i>Vulpes velox</i>
Wyoming pocket mouse ^b	<i>Perognathus fasciatus</i>

Source: WGFD, 1993; US Navy, 1976; Stark, 1993; Soehn, 1993.

^a Species observed within Township T 38-39N, Range R78W (on or in the vicinity of NPR-3).

^b Species observed during survey of NPR-3, August 1975 (US Navy, 1976).

^c Species observed by FD staff.

Table 3-5 Threatened, Endangered or Other Special Status Species Potentially in the Vicinity of NPR-3

Common Name	Scientific Name	Status ^a Federal State		Habitat/Location
<u>Plants</u>				
Barr's milkvetch	Astragalus barrii	C2	NL	Whitish sandy silty soil with sparse vegetative cover.
<u>Invertebrate</u>				
Narrow-foot hygrotus diving beetle	Hygrotus diversipes	C2	NL	Natrona County, near Midwest, Wyoming
<u>Fish</u>				
Sturgeon chub	Hybopsis gelida	C2	S	Powder River drainage
Shovelnose sturgeon	Scaphirhynchus platyrhynchus	NL	S	Powder River drainage
<u>Birds</u>				
White-faced ibis	Plegadis chihi	C2	PI	Wetland
Bald eagle ^b	Haliaeetus leucocephalus	E	E	Winter resident/migrant

Peregrin falcon	Falco peregrinus	E	E	Migrant
Ferruginous hawk	Buteo regalis	C2	NL	Grassland
Mountain plover	Charadrins montanus	C1	NL	Grassland
Black tern	Chlidonias niger	C2	PII	Wetland
Loggerhead shrike ^b	Lanius ludovicianus	C2	NL	Woodland/shrubland
<u>Mammal</u>				
Black-footed ferret	Mustela nigripes	E	E	Potential resident in prairie dog colonies
Plains (eastern) spotted skunk	Spilogale putorius interrupta	C2	NL	East of Bighorn and Laramie Mts.

Sources: Collins, 1993; Davis C. P., 1993; Neighbors, 1993; Soehn, 1993.

^a Status Code: C1 = Federal candidate - Category 1 (appropriate for listing)

C2 = Federal candidate - Category 2 (possibly appropriate for listing)

E = Endangered

NL = Not Listed

PI = Priority I - Species in need of immediate attention

PII = Wyoming Priority II - species in need of additional study

S = Sensitive Species in Wyoming

^b Species observed on NPR-3.

3.5.5 Floodplains and Wetlands

Although Flood Insurance Rate Maps (FIRM's) are available for certain parts of Natrona County, none have been prepared for the area around NPR-3 (Keller, 1993a). The FWS prepared National Wetland Inventory (NWI) Maps for the area surrounding NPR-3 in February 1993, which document the many impoundments and reservoirs within NPR-3. Some portions of the major stream beds are also classified as wetlands.

The topography of NPR-3, characterized by gently rolling uplands punctuated by narrow draws with steep embankments, suggests that floodplains are limited to lands within the embankments of the draws (Figure 3-6). It is likely that the areal extent of floodplains on NPR-3 roughly corresponds to Map Unit 195 in the soil survey in Table 3-3. The low permeability of the sodic soils which predominate in much of the watershed of the draws (Davis, 1993a) suggests that brief but very intense floods could occur following infrequent downpours.

Wetlands and other areas at NPR-3 that are regulated under Section 404 of the Clean Water Act appear to be limited to man-made ponds, stream channels, and to certain areas within the embankments of the draws. The basins of several small impoundments constructed in the larger draws on NPR-3 during the 1920's to create reservoirs to support early oil drilling efforts (Doyle, 1993) are likely to be wetlands. No soils on the list of hydric soils compiled by the SCS for Natrona County (Davis, 1993c) or Hydric Soils of the United States (NTCHS, 1991) appear on the soil survey for areas at NPR-3 outside of the draws.

The channels of perennial and intermittent streams within the draws are regulated under Section 404 of the Clean Water Act, even if they lack vegetation and therefore do not technically meet the definition of wetlands. Available information suggests that some portions of the draw bottoms are wetlands, although further study would be required to determine exactly how much. Draw bottom areas are mapped in Figure 3-5. Areas with the Flowing and Impounded

(Wet) Riparian Vegetation Association, which is dominated by sedges (*Carex* sp. and *Cyperus* sp.), rushes (*Juncus* sp.), and cattails (*Typha* sp.), were likely to have met the definition of wetlands at the time that the figure was generated. Areas mapped with the Upland (Dry) Riparian Vegetation Association, which is characterized by thistle (*Cirsium flodmanii*), yarrow (*Achillea lanulosa*), goldenrod (*Solidago* sp.) and occasional grasses and grass-like species, were likely not to have met the definition of wetlands (US Navy, 1976). The distribution of riparian vegetation may have changed since 1976 in draw bottoms downstream of NPDES-permitted points of discharge.

The partial extent of wetlands within the draw bottoms is also supported by soil survey data. The soil survey mapping unit which encompasses the draw bottoms (Figure 3-3) is primarily comprised of soils in the Haverdad and Clarkelen soil series, which are not listed as hydric by the National Technical Committee for Hydric Soils (NTCHS, 1991). However, the SCS notes that inclusions of other soil series which are hydric are known to occur within Map Unit 195. (Davis, 1993c)

The FWS has developed a system to classify wetlands and other waters of the United States (Cowardin, 1979). The man-made ponds discussed in Section 3.5.1 could be classified as Palustrine Open Water (POW) wetlands. The intermittent stream channels could be classified by the FWS as Riverine Intermittent Streambeds (R4SB). The perennial stream channels could be classified as Riverine, Upper Perennial Streambeds (R3SB). Areas within the draw bottoms but outside of the channels could be classified as Palustrine Emergent (PEM) or Palustrine Scrub-Shrub (PSS) Wetlands.

3.6 Cultural Resources

Shoshoni and Sioux tribes lived on the Wyoming Plains until the 1840's, when westward movement brought settlers on their way to Oregon via the Oregon Trail. The Oregon Trail followed a portion of the North Platte River Valley through Fort Laramie, Fort Caspar, and Fort Bridger. The land on which NPR-3 is located was used as hunting grounds by Native American tribes in the area. (Halliburton NUS, 1993)

Surveys of NPR-3 which were conducted in 1976 were unable to identify specific tribal groups which may have used the property. Six areas were identified as having a concentration of flakes and/or artifacts. Only one of these areas was recommended for additional survey work in 1976, and the remaining areas were determined to be of no importance. The one area identified for additional work is located in the southeast part of NPR-3. This area was classified as lithic, ceramic scatter, with possible rock shelters. The area contained a large number of scattered tools and ceramic shards, suggesting that the area could have been occupied on a seasonal basis. All of the artifacts collected during the survey were estimated to date back to AD 400. (U.S. Navy, 1976)

During the comment period for this EA, the Wyoming State Historic Preservation Office (SHPO) requested that additional surveys be done to locate cultural resources at NPR-3. The resulting Class III cultural resource inventory was completed in June 1995. The inventory identified 17 prehistoric sites, 13 isolated artifacts, and one historic site. Two of the 17 prehistoric sites are recommended for additional survey work and are considered eligible for listing on the National Register of Historic Places. Both of these sites contain hearth and rock shelter features which could provide additional information.

Petroleum development has shaped the history of NPR-3 and its immediate surroundings since the turn of the century. NPR-3 was established in 1915 in the wake of a national emphasis toward mineral resource conservation. Public versus private use of petroleum resources on these lands was a hotly contested political issue in the early 1900's, culminating in the "Teapot Dome Scandal" of 1924 (US Navy, 1976). Oil production at NPR-3 was discontinued in 1927 and did not resume again until 1959. From 1959 until 1976, oil production operations were established at NPR-3 in order to prevent the loss of oil to adjacent lands (Lawrence Allison, 1987; Halliburton NUS, 1993). In response to the oil shortages of the mid-1970's, President Carter authorized the development of NPR-3 to the maximum efficient rate (MER). Since that time, oil has been continuously pumped from NPR-3.

Teapot Dome Oil Field (Site 48NA831) has been determined to be eligible for inclusion in the National Register of Historic Places. This was confirmed by the 1995 inventory. In addition, three cultural resources sites located within NPR-3 (48NA2180, 48NA2181, and 48NA2182) were not evaluated for inclusion during the 1976 inventory. These

sites were not relocated during the 1995 inventory.

Several other sites which are eligible for listing or are listed on the National Register are located close to NPR-3. These include: Casper Buffalo Trap, Casper (6/25/74); Fort Casper, Casper (8/12/71 and 7/19/76); Independence Rock, Casper (10/15/66); Martin's Cove, Casper (3/8/77); Midwest Oils Company Hotel, Casper (11/17/83); South Wolcott Street Historic District, Casper (11/23/88); Stone Ranch Stage Station, Casper (11/01/82), Teapot Rock, 6 miles SW of NPR-3 (12/30/74); and Townsend Hotel, Casper (12/25/83). (U.S. National Park Service, 1991)

3.7 Socioeconomics

3.7.1 Population and Employment

The socioeconomic study area is defined for the purposes of this EA as Natrona County (including the City of Casper and other incorporated municipalities). The estimated 1990 population of Natrona County was 61,226 (CAEDA, 1993). The estimated 1990 population of the City of Casper was 46,742, which accounted for 76.3 percent of the total population of Natrona County (CAEDA, 1993). Population in Natrona County dropped by 14.8 percent between 1980 and 1990, from 71,856 to 61,226 (CAEDA, 1993). This population loss reflected a statewide trend brought about by declining oil prices and subsequent decreasing employment in the early 1980's.

Population growth in the county is expected to occur at a slow but steady rate over the next five years, with the population projected to reach 64,926 in 1998. This is a projected 6 percent increase over the 1990 total population, but is still less than the peak 1980 population of 71,856 (State of Wyoming, 1992a). This growth rate is approximately the same as that projected for the entire state, which is also expected to grow by about 6 percent over the same period (State of Wyoming, 1992a). The majority of Natrona County's population growth is expected to occur in and around the City of Casper.

Total employment in Natrona County was 36,637 in 1990, an increase of 3.6 percent over 1989. Unemployment in Natrona County in 1990 was 5.8 percent, down from 6.9 percent in 1989, and slightly higher than the statewide average of 5.4 percent (CAEDA, 1993). The largest employment sectors in the county (for non-proprietary employees) are in services (32%), retail trade (23%), and government and government enterprises (17%), which together in 1990 employed 72 percent of all workers in the study area (State of Wyoming, 1992a). On a statewide level, these sectors accounted for about 62.3 percent of all jobs in 1990 (State of Wyoming, 1992b).

Per capita income in Natrona County was \$13,446 in 1990, slightly higher than the statewide average of \$12,008 (Rand McNally, 1992).

3.7.2 Housing

Natrona County has approximately 29,082 housing units, of which approximately 69 percent are owner-occupied and approximately 31 percent renter-occupied. Within the City of Casper, the ratio is 66 percent owner-occupied to 34 percent renter-occupied (Morris, 1993). Eighteen percent of all housing units in Natrona County were vacant in 1990, compared to 14.7 percent in Casper that same year (Morris, 1993). The median home value in Natrona County in 1990 was \$53,100, approximately 16 percent lower than the median value of \$61,600 for the state of Wyoming. For the renter-occupied housing units, the median rent in 1990 was \$252, compared to the statewide average of \$270 (Wyoming State Data Center, 1992). New construction in Natrona County (as indicated by the number of building permits issued) decreased by 43 percent between 1980 and 1990, from 1,343 to 764 (CAEDA, 1992).

3.7.3 Transportation

Interstate Highway 25 provides the major north-south access through much of Natrona County, and is located approximately 8 miles (13 km) west of the NPR-3 site. Interstate 25 is a four-lane interstate highway with a median and narrow shoulders. Wyoming Route 259 is a two-lane secondary road with no median and narrow shoulders, which runs in a general north-south direction, connecting Interstate 25 with Wyoming Route 387. The NPR-3 site is accessed

by a gravel road which is entered from Route 259, approximately 5 miles (8 km) south of the town of Midwest.

In 1991, the estimated Vehicles Per Day/Average Daily Totals (VPD/ADT) for Interstate 25 at the north Casper city limit was 3,710 (both directions). The VPD/ADT for Interstate 25 at Ormsby Road was also 3,710, and the VPD/ADT for Interstate 25 at Wyoming Route 259 was 3,270 in 1991. Wyoming Route 259 had an estimated VPD/ADT of 1,490 in 1991 (Leek, 1993). VPD/ADT totals show the current level of service on these road segments to be well below their carrying capacity. Traffic conditions on these roads, therefore, could be characterized as free-flowing with no congestion (Leek, 1993).

A road construction project on approximately 10 miles (16 km) of Interstate 25 north of the Casper city limit was recently completed. No other major construction projects are anticipated for roads in the vicinity of NPR-3 (Leek, 1993).

Air transportation services in Natrona County are provided at the Natrona County International Airport in Casper. The airport offers both freight and passenger services. Private airstrips are likely to exist in the county, although information concerning their exact number and location is not available (Keller, 1993b).

Rail transportation services are provided by the Burlington Northern Railroad and the Chicago and Northwestern Railroad. Both railroads run in a northwest-southeast direction and are located approximately 35 miles (56 km) south of NPR-3. Both railroads provide freight service only (no passenger service) to the Casper area.

3.7.4 Community Services

Public education in Natrona County is provided by the Natrona County School District No. 1, which has jurisdiction over the entire county. Total enrollment during the current school year (1992-1993) is 12,975, and the total number of certified teachers is 904 (Cadwell, 1993; Catellier, 1993). The district operates a total of 39 schools, including 26 elementary schools, 3 high schools, 4 junior high schools, 1 correctional school, and 6 rural schools. Attendance in these schools is generally below capacity (Cadwell, 1993).

Health services in Natrona County are provided by the Wyoming Medical Center in Casper, which has a maximum capacity of 232 beds.

Police protection in Natrona County is provided by the Natrona County Sheriff's Office, which has one police station and approximately 70 sworn officers (Calder, 1993). The City of Casper also maintains a police force, consisting of one station and approximately 68 sworn officers (Honeycutt, 1993).

Fire protection services in the county are provided by the Natrona County Fire Department, which has one fire station and 13 full-time firefighters. Additional fire protection is provided by 6 volunteer fire departments, which are located throughout the county. Fire protection services for NPR-3 are provided by the Midwest and Edgerton volunteer fire departments, approximately 15-20 minutes away (Sullivan, 1993). The City of Casper Fire Department consists of 5 stations and 67 firefighters (Loomis, 1993).

The chief provider of electric service in Natrona County is the Pacific Power & Light Company. Gas service is provided by Northern Gas of Wyoming (CAEDA, 1992).

Municipal water for the city of Casper is derived from the North Platte River and local wells, and is treated locally by chlorination. Total capacity is 40 million gal (151,000 m³)/day, with a storage capacity of 21.5 million gallons (81,400 m³). Peak demand is 28 million gal (106,000 m³)/day (CAEDA, 1992). The town of Midwest receives its potable water from Casper through an underground pipeline, and Edgerton has three main wells which supply the town with water (U.S. Navy, 1976).

The Casper sewage treatment system serves the Casper metropolitan area. The system consists of primary and secondary treatment, chlorination and chlorine removal. The current capacity is 12.8 million gal (48,400 m³)/day and the current load is 7.5 million gal (28,400 m³)/day. (Hill, 1993)

Residential garbage collection in the city of Casper is provided primarily by the City of Casper. Private hauling services are provided in Natrona County by BFI, as well as other smaller garbage haulers. The county has three landfills: in Casper, Alcova, and Midwest. (Dundas, 1993)

3.8 Waste Management

3.8.1 Hazardous Waste

The Resource Conservation and Recovery Act (RCRA) (42 USC 9601-9675 *et. seq.*) regulates the treatment, storage, and disposal of solid waste (both hazardous and non-hazardous). Much of the waste generated at the site is exempt under 40 CFR 261.4 (b)(5), which defines the following solid wastes as exempt from the designation of hazardous: "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy". Crude oil, natural gas, and associated liquid petroleum gasses (LPG) are produced at NPR-3. (Lawrence Allison, 1987)

NPR-3 is listed as a conditionally exempt small quantity generator under RCRA. As such, NPR-3 could generate no more than 100 kg (220 lb) of hazardous waste per month and total on-site accumulation could not exceed 1,000 kg (2,205 lb) of hazardous waste, or 1 kg (2.2 lb) of acutely hazardous waste, at one time. During Calendar Year 1993, NPR-3 generated 88 kg of hazardous waste, which was mostly off-spec. PVC pipe cement. A Treatment, Storage and Disposal (TSD) permit is not currently required for NPR-3 under RCRA.

Drilling and production wastes at NPR-3 include oil, water, drilling mud, cuttings, well cement, produced waters, and sediments and sludges from produced water pits. Oil from wells is routed to test satellites and tank batteries, and water from the tank batteries is discharged into pits or injected into a UIC-permitted well. This water contains residual oil. Other RCRA-exempt wastes generated at NPR-3 include sediment and tank bottoms from pits and storage tanks, pigging wastes, soil contaminated with crude oil, and spent filters (DOE, 1992b).

In accordance with the Superfund Amendment Reauthorization Act (SARA) Title III, chemicals are evaluated to determine if any are listed as extremely hazardous substances, and if any of these are utilized at NPR-3 in reportable threshold planning quantities (TPQ). NPR-3 submits annual Tier II reports for items such as treating chemicals, hydrochloric acid, gasoline, diesel fuel, ethylene glycol, propane, and butane-gasoline mixture. The current maximum quantity of all chemicals stored at NPR-3 at any given time is 25,000 gallons (95 m³) (DOE, 1990). Table 3-6 lists substances currently used at NPR-3 and the approximate annual usage.

There are three Underground Storage Tanks (USTs) at NPR-3: one 4,000 gallon (15.1 m³) diesel tank, one 4,000 gallon (15.1 m³) gasoline tank, and one 2,000 gallon (7.6 m³) gasoline tank. Two other USTs were on-site: one 1,260 gallon (4.8 m³) used oil tank and one 2,000 gallon (7.6 m³) methanol tank, but these have since been removed. (Fosdick, 1990; FD Services, 1993)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601-9675 *et. seq.*), establishes liability, compensation, clean-up, and emergency response by the Federal Government for hazardous substances released into the environment and for the clean-up of inactive hazardous waste disposal sites. A Phase I study of the site was completed in 1987 (Lawrence Allison, 1987). A Phase I study is designed to evaluate site history and records to locate and identify hazardous waste disposal sites. Historically, a variety of CERCLA-regulated substances have been used at NPR-3 (Table 3-7).

Other substances used in the past on NPR-3 include additives to drilling mud (crude oil, quebracho, phosphate), dehydrators (sulfonated oleic acid), aromatic solvents, emulsion breakers, polymers, oxyalkyl phenols, glycol, and isopropyl alcohol.

3.8.2 Pesticides

An inventory of pesticides conducted in 1990 identified the following substances at NPR-3: NalKil, Fenavar, and Ferti-Lome (Herbicides); Mouse-pruf (Rodenticide); and Bioguard (Insecticide) (DOE, 1990).

Until the summer of 1994, herbicide application was contracted to third parties. Company personnel began using the general-use herbicides Roundup, Banvil and Karmex for clearing parking lots, fence lines and areas around production equipment and buildings. Herbicides would be stored in a shed at the chemical dock. Herbicides would be purchased in small quantities and return agreements made with vendors whenever possible to limit the amount stored onsite. Rodenticides, such as D-Con and spray indoor insecticides, are kept at the warehouse.

3.8.3 Radioactive Waste

NPR-3 generates radioactive waste which is classified as "Naturally Occurring Radioactive Material" (NORM). These wastes are the by-products of oil and gas production in an area with naturally high radioactivity in the subsurface (UNC Remediation, 1990). Tests done to detect NORM have indicated a NORM level below proposed State limits.

The project also uses logging tools, which contain sealed radioactive sources, to measure the properties of the rock formations. In the event of an accident involving a sealed radioactive source, emergency procedures have been coordinated between the DOE, Contractor, and owner of the tools. These procedures would be used to minimize the potential exposure to radiation, and ensure that the source is properly contained. Small amounts of liquid radioactive tracers are also occasionally used. These isotopes are specially selected for their short half-life and quickly decay.

3.8.4 Waste Disposal

Disposal sites at NPR-3 include an industrial solid waste landfill, reserve pits, injection wells and the Bad Oil facility (DOE, 1992). Past disposal practices are fully covered in the Phase I study (Lawrence Allison, 1987) and are only repeated here when clarification is needed.

Thirteen solid waste disposal areas have been identified on the property. Eleven of these sites were used for non-hazardous waste. Two sites were used for the disposal of drilling mud (Lawrence Allison, 1987). Presently, NPR-3 has one industrial solid waste landfill which is 7.55 acres (1.9 ha) in size and would be developed in three phases. The landfill is currently in Phase I, which consists of the eastern third of the landfill (FD Services, 1992c).

Table 3-6 Substances Presently Used at NPR-3

Substance ^a	Monthly Amount ^b (gal)		Use
Nalco 19	0 (20 Pounds in inventory)		Removal of excess oxygen
Nalco 962	164		Scale inhibitor
Nalco 3211	113		Scale inhibitor
Nalco 3390	120		Oil/Water separator
Nalco 3403	0 used ^c ; 19 gallons in storage at Gas Plant		Corrosion inhibitor
Nalco 3540	0		Acid pipeline cleaner
Nalco 3554	2		Glycol inhibitor
Nalco 3656	83		Corrosion inhibitor
Nalco 3900	0		Uni-treat packer fluid
Nalco 3903	220		Scale inhibitor
Nalco 3919	0 (discontinued	1993)	Scale inhibitor
Nalco 3940	4.5		Surfactant
Nalco 3999	0 (discontinued	1993)	Bactericide

Nalco 4453	38		Slugging compound
Nalco 4483	13		Emulsion breaker for Tensleep
Nalco 4493	117		Emulsion breaker
Nalco 4725	0		Batched into high paraffin oil
Nalco 4764	90		Solid dispersant
Nalco 4818	86		Reverse emulsion breaker
Nalco 4919	47		Corrosion inhibitor
Nalco 7290	5		Resin rinse
Nalco 8735	198		pH control
Nalco 89VE130	352		Paraffin dispersant
Methyl Mercaptan	1		Provides odor for leak detection in propane
Solvent 140	29		Solvent

Notes: ^a These substances are noted by the Manufacturers name.

^b Usage is based on the month of August 1994 and does not include chemicals stored at the Chemical Dock. However, annual usage may be calculated by multiplying by 12 since monthly usage does not vary greatly.

^c None used in August 1994, but the substance is used in other months.

Table 3-7 Hazardous Substances Historically Used at NPR-3

Substance	Approximate Dates of Usage	Use
Caustic Soda (Anhydrous sodium hydroxide)	1940-1950, 1970's- 1980's, 1993-Present	Treatment of native mud, drilling additive, water treatment plant
Chrome lignosulfonate	1960's	Corrosion inhibitor
Hydrochloric Acid	1950's - Present	Cleaning of wells and flowlines
Sodium chromate	Late 1970's	Drilling additive
Sodium bichromate	Late 1970's	Drilling additive
Hydrofluoric Acid	Unknown	Unknown
Xylene	Unknown to present	Well production
Ethylene glycol	Unknown to present	Gas processing
Methanol	Unknown to present	Gas processing
n-butyl alcohol	Unknown to present	Well production

Sources: Lawrence Allison, 1987; 40 CFR 302.

The NPR-3 industrial landfill is operated in a trench-and-fill method. The total landfill capacity is 15,500 cubic yards (11,900 cubic meters) (DOE, 1992; FD Services, 1992c). Industrial waste entering the landfill includes office waste, shipping boxes, oil-absorbent pads and booms, water filters, and other non-hazardous RCRA-exempt wastes. Special wastes entering the landfill include gas plant glycol filters and an occasional bag of unused non-hazardous chemicals such as potassium chloride or polyacrilimide (FD Services, 1992c). Spent iron sponge was disposed of three times in the last seven years with WYDEQ approval. However, iron sponge is no longer used at the gas plant, and has been replaced by Sulfatreat (FD Services, 1992c). Recycling of scrap metal, office paper, and aluminum cans is part of the Waste Minimization Program. In addition to the landfill, there is a landfarm which is used for the treatment of oil-contaminated soil. (FD Services, 1992c)

At the present time, NPR-3 contracts for solid waste collection and disposal. One 30-yard roll-off container is stationed in the field and is picked up and hauled to Casper as needed. On-going labor costs for operation and maintenance of the facility makes daily operation of the landfill impractical. Even though FD subcontracts with a private hauler to haul most of the solid waste, the landfill/landfarm remains in operation to maintain the WYDEQ permit, for treating oil-contaminated soils and for disposing of large quantity waste such as tank bottoms and empty sacks from drilling and workover operations.

Reserve pits handle wastes generated during well drilling, completion and workover (DOE, 1992). There are also four injection (disposal) wells on-site, used for backwash water from the water softener, produced water from oil reservoirs, and for disposal of other exploration and production (E&P) exempt wastes. Finally, there is a Bad Oil Facility which is used to hold oil for recycling, and sludge recovered from drilling pits, well servicing, tank and treater cleaning. Sludge from the Bad Oil Facility is collected in aboveground storage tanks and then applied to roads on-site in accordance with permits issued by WYDEQ (DOE, 1992).

3.9 Summary of the Affected Environment

The affected environment at NPR-3 considered by this Sitewide EA is summarized in Table 3-8.

Table 3-8 Summary of Affected Environment

LAND RESOURCES	3.1	
Land Use	3.1.1	Intensive development in central third, scattered development in northern third, little or no development in southern third and on bluffs.
Aesthetics	3.1.2	Typical of oilfields. Cleaner than most.
Recreation	3.1.3	No recreational facilities within or adjoining NPR-3.
AIR QUALITY AND ACOUSTICS	3.2	
Meteorology and Climate	3.2.1	Semi-arid with approximately 9 to 12 inches (23-30 cm) of precipitation annually; average low temperature in winter about 0°F (-18°C); average max temperature in summer 80 to 85°F (27-30 °C).
Air Quality	3.2.2	H ₂ S emissions from EOR activities.

Acoustics	3.2.3	Typical of oilfields.
WATER RESOURCES	3.3	
Surface Water Quantity	3.3.1	Ephemeral and intermittent streams in draws, small man-made ponds.
Ground Water Quantity	3.3.2	No high quality freshwater aquifers under NPR-3.
Surface Water Quality	3.3.3	Oil well production water discharged to draws under NPDES permits from WYDEQ.
Ground Water Quality	3.3.4	Water injection under UIC permits from WYOGCC.
Potable Water	3.3.5	Purchased from town of Midwest.
GEOLOGY AND SOILS	3.4	
Geology	3.4.1	Series of oil-bearing strata (reservoirs), several faults evidenced by the draws, seismically inactive.
Soils	3.4.2	Highly alkaline and saline soils derived from alkaline parent materials.
Prime Farmlands	3.4.3	None present within NPR-3 according to USDA Soil Conservation Service.
BIOLOGICAL RESOURCES	3.5	
Aquatic Biology	3.5.1	No fish reported in ephemeral and intermittent streams. One stocked pond exists at NPR-3.
Terrestrial Vegetation	3.5.2	Primarily rangeland, small areas of riparian vegetation (in draws) and pine-juniper forest (on bluffs). No forest management.
Terrestrial Wildlife	3.5.3	Typical of eastern Wyoming; No hunting or active wildlife management.
Threatened and Endangered Species	3.5.4	Federally-listed species possible: Blackfooted ferret, bald eagle (sighted, but no known nest within NPR-3), peregrine falcon. Previous blackfooted ferret survey negative.
Floodplains and Wetlands	3.5.5	Narrow zones within draws.
CULTURAL RESOURCES	3.6	Evidence of previous habitation by Native American tribes (likely Shoshoni and Sioux); Historical value of site due to Teapot Dome

		scandal in 1920's.
SOCIOECONOMICS	3.7	
Population and Employment	3.7.1	Natrona County characterized by slow population growth and unemployment rates similar to the state average.
Housing	3.7.2	No housing at NPR-3; housing availability abundant in Natrona County.
Transportation	3.7.3	All public highways servicing NPR-3 are free-flowing with no congestion.
Community Amenities	3.7.4	No shortages in Natrona County.
WASTE MANAGEMENT	3.8	
Hazardous Waste	3.8.1	Small quantities present at NPR-3. Off-site disposal if required.
Pesticides	3.8.2	Small quantities used and stored onsite at chemical dock.
Radioactive Waste	3.8.3	Only concern is low level of naturally occurring radioactive material (NORM's) generated by oil and gas production operations. Past tests show that the site is below proposed State limits for NORM.
Waste Disposal	3.8.4	Small quantities of waste disposal at the following on-site facilities: industrial solid waste landfill, reserve pits, injection wells, and bad oil facility.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Section 4.0 discusses environmental consequences (impacts) that could result from implementation of the Proposed Action and each alternative. The potential impacts of the Proposed Action are presented first. For each potential impact identified, specific mitigation measures have been proposed that would render the impact inconsequential. No potential impacts to any resource area from the Proposed Action have been identified for which practicable mitigation measures could not be developed.

Resource areas are addressed in the same order as the affected environment discussions in Section 3.0: land resources (Section 4.1), air quality and acoustics (Section 4.2), water resources (Section 4.3), geology and soils (Section 4.4), biological resources (Section 4.5), cultural resources (Section 4.6), socioeconomics (Section 4.7), and waste management (Section 4.8). The discussion under each resource area includes environmental consequences (impacts) and mitigation measures. Section 4.9 includes a summary of the impacts and mitigation measures under the Proposed Action and Section 4.10 covers a brief discussion of cumulative impacts.

4.1 Land Resources

4.1.1 Land Use

Environmental Consequences of the Proposed Action: Under the Proposed Action, approximately 250 to 300 acres of land would be directly disturbed. Most land disturbance would be confined to an approximately 2500-acre region located in the central third of NPR-3. Other parts of NPR-3 would experience limited disturbance, at most. Land use under the Proposed Action would remain compatible with existing land uses at NPR-3 and surrounding lands. Because mineral extraction activities are exempt from the county zoning resolutions, there are no zoning conflicts associated with the Proposed Action.

Scattered, minor land disturbances would result from general operations and support activities across the Reserve. Within the 2500-acre region where impacts would be concentrated, disturbance of approximately 30 acres (12 ha) of land would be required to support relocation and operation of each of the five steamflooding systems. Future development would occur on relatively gentle upland slopes rather than on steep side slopes, and no construction (other than road, pipeline, and utility crossings) is planned for riparian areas.

Minor land disturbances would also result from livestock grazing. The Department of Energy intends to lease the acreage for sheep grazing between January 1 and April 30. Increased wind and water erosion could occur in isolated areas as a result of over-grazing and the spread of noxious weeds could degrade range quality. Reduced range quality would also translate to decreased quality of wildlife habitat. Impacts of soil compaction would be concentrated primarily in bedding areas and along the trails which the sheep use. There would be some impact to riparian areas, although this will be limited because grazing would be in the spring when water demands are not as high.

Mitigation Measures: Temporarily disturbed areas would be mitigated in accordance with recommended reclamation procedures included in the plan cooperatively developed for NPR-3 by DOE and the Soil Conservation Service (SCS, 1992). Remaining areas used for ongoing development and oil production would be revegetated upon completion of those activities. Livestock numbers would be maintained at a low enough level to prevent major impacts. Additionally, grazing activities would be closely monitored and areas receiving use beyond their capacities would be isolated until the areas recover. A site-specific grazing management plan discussing the impacts and mitigation measures in detail, would be prepared.

Environmental Consequences of the EOR Technology Alternative: This alternative requires a similar level of drilling, road, pipeline and facility construction as the Proposed Action. The environmental consequences and mitigation measures are, therefore, generally the same.

Mitigation Measures: Mitigation measures would be generally the same as in Proposed Action.

Environmental Consequences of the Divestiture Alternative: A Finding of No Significant Impact (FONSI) was declared for the proposal to sell NPR-3. Subsequent to the publication and distribution of that EA, no further consideration has been given to the proposal to sell NPR-3. DOE ownership and management of NPR-3 are expected to continue into the foreseeable future. Therefore, sale to the private sector is not considered a likely alternative to the Proposed Action presented in this EA. If NPR-3 were sold to a private interest, it would likely be managed as an oilfield in a manner similar to that used by the DOE under the Proposed Action. However, an independent operator may choose to operate NPR-3 as a stripper oilfield and minimize new investment. The potential environmental impacts would basically be similar to, or less than, those under the Proposed Action. On the other hand, an independent operator may be less attentive to environmental protection than DOE, therefore the net impact is difficult to quantify.

Mitigation Measures: Mitigation measures might include provisions for oversight of operations, such as regulation by the Bureau of Land Management. Covenants in the sale contract might also be used to ensure that long-term environmental protection continues after the sale.

Environmental Consequences of the No-Action Alternative: Under the No-Action Alternative, existing wells and facilities would continue to be operated until the costs to lift a barrel of oil exceed the revenue gained on a well-by-

well basis. There would be no additional new disturbed acreage, resulting in slightly lower levels of fugitive dust and less disturbance of natural habitat. Roads and facilities would be reclaimed to natural habitat as wells became uneconomical to continue production.

Mitigation Measures: There are no mitigation measures required under this alternative.

Environmental Consequences of the Decommissioning Alternative: Under this alternative, NPR-3 would cease production and begin environmental restoration. The level of activity would remain relatively high for several years while restoration and decommissioning occurs, but would cease at the completion of remedial action.

Mitigation Measures: There are no mitigation measures required for this resource.

4.1.2 Aesthetics

Environmental Consequences of the Proposed Action: Because of the existing state of disturbance throughout most of NPR-3 and the presence of other privately owned oilfields in the surrounding area, activities under the Proposed Action would have a negligible visual impact. Continued development would result in construction of additional roads, well locations, and support facilities in those parts of NPR-3 that already contain similar facilities. Any activities associated with oil extraction would be consistent with existing visual characteristics of the region. Because of the rim of bluffs surrounding much of NPR-3, activities performed at NPR-3 would not have an impact on any regional viewsheds. Development activities would not be visible to the general public or from the Wyoming Highway 259 corridor.

Mitigation Measures: No mitigation measures to offset minor visual changes resulting from the Proposed Action are necessary.

Environmental Consequences of the other Alternatives: None of the alternatives would generate any visual impacts, for the same reasons as discussed in the Proposed Action.

Mitigation Measures: No mitigation measures to offset minor visual changes resulting from the alternatives are necessary.

4.1.3 Ration

Environmental Consequences of the Proposed Action: There would be no impacts to recreational facilities as a result of continued development at NPR-3. No major recreational facilities exist at or in the immediate vicinity of NPR-3. The anticipated demand for regional recreational facilities would not be affected, since work force requirements associated with continued development would not change (Section 4.7.1).

Mitigation Measures: Because there are no major existing recreational facilities that could be adversely impacted by the Proposed Action and because the Proposed Action would not increase the demand for regional recreational facilities, no mitigation measures are necessary.

Environmental Consequences of the other Alternatives: None of the alternatives would generate any impacts to recreational resources, for the same reasons as discussed in the Proposed Action.

Mitigation Measures: No mitigation measures to offset resulting from the alternatives are necessary.

4.2 Air Quality and Acoustics

4.2.1 Meteorology and Climate

Environmental Consequences of the Proposed Action: No impacts to the meteorology and climate of the region

containing NPR-3 would result from continued development at NPR-3.

Mitigation Measures: Because the Proposed Action would not adversely affect the regional climate, no mitigation measures are necessary.

Environmental Consequences of the other Alternatives: No impacts to the meteorology and climate of the region containing NPR-3 would result from adoption of any of the alternatives.

Mitigation Measures: Because the alternatives would not adversely affect the regional climate, no mitigation measures are necessary.

4.2.2 Air Quality

Environmental Consequences of the Proposed Action: Potential impacts to air quality from the Proposed Action would be limited. Emissions of air pollutants, including particulates, sulfur dioxide, carbon monoxide, hydrogen sulfide, nitrogen oxides and hydrocarbons would be maintained within permitted levels. Construction and operation of facilities and the drilling of additional injection and production wells under the Proposed Action could also cause limited increases in fugitive dust levels.

Continued EOR operations would stimulate the growth of anaerobic sulfur reducing bacteria, resulting in continued production of hydrogen sulfide (H₂S). An H₂S flare pilot facility to test disposal of excess H₂S emissions was put into operation in 1992. Installation of a permanent H₂S disposal system would likely require an air quality permit for construction (Raffelson, 1992). Improvements in the development of chemical, microbial and biocide treatment technologies, as a part of the Proposed Action, could potentially further reduce H₂S emissions.

Mitigation Measures: All air emissions associated with continued development would be maintained within permitted levels. A consultant firm has been hired to prepare a Title V Permit. Operating scenarios of the proposed Action would be included in the permit. H₂S levels would be controlled through microbial or biocide well treatment, chemical oxidation of the gas, and/or additional flaring. Fugitive dust emissions would be in direct proportion to disturbed acreage, but with reclamation should not exceed the WYDEQ standard within the project area or at the boundary. During project construction, fugitive dust would be reduced by wetting problem areas (perhaps using water obtained from the Madison formation), and by restricting vehicle travel wherever practicable. Crude oil sludge application to the roads reduces dust emissions. The application of sludge to the roads is permitted by WYDEQ for dust control.

Environmental Consequences of the EOR Technology Alternative: Depending on the choice of EOR method, substantial emissions of carbon dioxide, nitrogen, and flue gasses would be released. Since continued development of the steamflood would be halted, H₂S and nitrogen oxides emissions would decrease. Other impacts to air quality, such as fugitive dust, would be similar to the Proposed Action because the level of activity would be approximately the same.

Mitigation Measures: Mitigation measures for increased carbon dioxide emissions would include the construction of a gas sweetening module at the gas plant to remove and recycle carbon dioxide.

Environmental Consequences of the Divestiture Alternative: It is believed that private owners would manage the project in a manner similar to current operations. Impacts would be similar to those of the Proposed Action.

Mitigation Measures: Mitigation measures would be similar to those of the Proposed Action.

Environmental Consequences of the No-Action Alternative: Air emissions would start at the same level as the Proposed Action, and then slowly decrease in all criteria as the project sinks into non-profitability.

Mitigation Measures: Mitigation measures would be similar to those of the Proposed Action, except that only those measures that make sense in the context of a short remaining project life would be executed.

Environmental Consequences of the Decommissioning Alternative: Most major emissions sources would stop immediately. Other sources, such as fugitive dust and hydrocarbon emissions, would cease upon completion of restoration activities.

Mitigation Measures: No mitigation measures for the Decommissioning Alternative would be required.

4.2.3 Acoustics

Environmental Consequences of the Proposed Action: Noise emissions from construction activities and onsite operation of continued development activities would not be anticipated to result in any increases to ambient noise levels outside of the boundaries of NPR-3. During construction and operation activities, limited increases to ambient noise levels could potentially occur at NPR-3 and would primarily be associated with steam generator and water treatment facilities, drilling rigs, and vehicle traffic.

Mitigation Measures: Although no increase in noise levels are expected to occur outside the boundaries of NPR-3 as a result of the Proposed Action, ongoing measures for the protection of workers' hearing would continue to be implemented. These measures would include the use of standard silencing packages on construction equipment, and the use of OSHA-approved earmuffs or earplugs in designated areas or buildings which experience elevated noise levels.

Environmental Consequences of the EOR Technology Alternative: Noise levels from a similar level of industrial activity would generate environmental consequences similar to those in the Proposed Action.

Mitigation Measures: Noise levels from a similar level of industrial activity would require mitigation measures similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Noise levels from a similar level of industrial activity in the private sector would generate environmental consequences similar to those in the Proposed Action.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the No-Action Alternative: Noise levels from the No-Action Alternative would generate environmental consequences similar to those in the Proposed Action. A generally reduced level of activity would not reduce high noise levels at specific sites. However, fieldwide noise levels would decrease over time as wells were shut in and activities reduced.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Decommissioning Alternative: Noise levels from the Decommissioning Alternative would generate environmental consequences similar to those in the Proposed Action while industrial activity continued. A generally reduced level of activity would not reduce high noise levels at specific sites. However, fieldwide noise levels would decrease over time as wells were shut in and activities reduced.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

4.3 Water Resources

4.3.1 Surface Water Quantity

Environmental Consequences of the Proposed Action: No water would be withdrawn from any surface water bodies under the Proposed Action.

The present discharges to surface water bodies (Little Teapot Creek and its tributaries) would remain the same or increase under the Proposed Action. The degree of increase would depend upon the success of the proposed biological

treatment area. As indicated in Section 4.3.1, the principal source of discharged effluent is produced formation water generated by conventional oil recovery and EOR techniques. Under the Proposed Action, produced water would continue to be generated by both continued conventional in-fill development and by EOR activities. Small amounts of excess water not injected into UIC permitted wells or used as make-up water for EOR activities would continue to be discharged to the draws under the existing NPDES Permits (Table 3-2).

One research project proposed for RMOTC involves the creation of a biological treatment area designed to use halophytic (salt-loving) plant species to bind chlorides and remove oil and grease from produced water and lower its toxicity. If successful, the majority of produced water which is currently injected underground, or that does not meet present discharge limits, would be discharged through a new NPDES permit at the treatment area. This would result in a substantial increase in the amount of surface water discharge at NPR-3. The quality of this water would be equal to or better than that of current discharges.

Several production wells would be expected to be shut down in future years as their oil production rate diminishes. Closure of production wells could result in a decrease in the production of produced water. However, overall discharges are expected to remain the same or increase due to the biological treatment area.

Most activities considered under the Proposed Action would not generate large new areas of impervious surfaces which could increase storm water runoff discharges following rainfall events. New access roads and well pads servicing both the proposed conventional in-fill development and EOR activities would primarily comprise dirt, gravel, or other pervious surfaces. Small quantities of additional surface runoff could be generated due to soil compaction by heavy equipment.

Construction of some of the support facilities under the Proposed Action (such as a waste collection and treatment facility) could require the construction of small paved areas. The total increase in the area of impervious surfaces on NPR-3 (pavements and rooftops) would be less than 1 acre (0.4 ha), and incapable of generating measurable increases in flow in any stream channel.

A few large projects that could possibly be conducted at NPR-3 in the future could involve the construction of larger areas of impervious surfaces. If the facility were larger than 5 acres, a general stormwater discharge permit would be required.

Mitigation Measures: No mitigation is necessary to address small quantities of storm water runoff that could be generated by the Proposed Action. Surface water discharges are expected to remain the same or increase slightly which is not considered to be an adverse effect.

Environmental Consequences of the EOR Technology Alternative: Requirements for support facilities under the EOR Technology Alternative would be similar to that of the Proposed Action. Surface water flow rates would also be largely unchanged.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Surface water impacts from a similar level of industrial activity would generate environmental consequences similar to those in the Proposed Action. There would be no increase in produced water discharge from the biological treatment area, therefore discharges would be expected to remain the same or decrease slightly over time, as the amount of produced water decreases.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the No-Action Alternative: Surface water flow would return to pre-development levels after the project reaches its economic limit and decommissioning begins.

Mitigation Measures: Mitigation measures would include continued use of Madison water supply wells to compensate for lost oilfield discharges.

Environmental Consequences of the Decommissioning Alternative: Surface water flow would be quickly returned to pre-development levels.

Mitigation Measures: Mitigation measures would include continued use of Madison water supply wells to compensate for lost oilfield discharges.

4.3.2 Ground Water Quantity

Environmental Consequences of the Proposed Action: Because no aquifers bearing high quality fresh water exist in the immediate vicinity of NPR-3, no such aquifers could be potentially depleted by the Proposed Action. Continuation of oil extraction by either conventional or EOR technologies would inevitably involve the simultaneous withdrawal of water from the oil bearing formations. However, this water is too high in total dissolved solids (TDS) and hydrocarbons to be suitable for use as potable water (Section 3.3.2). Water would continue to be withdrawn from the Madison formation to be used as make-up water for EOR activities under the Proposed Action. Because the salinity of the Madison formation water renders it unsuitable as potable water (Section 3.3.2), no adverse competition with regional demands for potable water would be possible. Since the Madison formation is deep and overlain by competent (rigid) strata not susceptible to compression, there is no potential for land subsidence due to groundwater withdrawals (Doyle, 1993).

Mitigation Measures: As there are no potentially competing uses for Madison formation water or other groundwater resources present at NPR-3, and because there is no potential for land subsidence, there is no need to mitigate for any potential overdraft of groundwater at NPR-3.

Environmental Consequences of the other Alternatives: No impacts to groundwater quantity at NPR-3 would result from adoption of any of the Alternatives.

Mitigation Measures: Because the Alternatives would not adversely affect groundwater quantity, no mitigation measures are necessary.

4.3.3 Surface Water Quality

Environmental Consequences of the Proposed Action: All discharges under the Proposed Action would comply with the terms of NPDES Permits. Existing NPDES permits (Table 4-5) would be renewed as required, but no modifications to the effluent limits would be sought. In cases where discharge requirements could not be met, the water would be injected into UIC injection wells permitted by the Wyoming Oil and Gas Conservation Commission.

One research project proposed for RMOTC involves the creation of a biological treatment area designed to use halophytic (salt-loving) plant species to bind chlorides in produced water and lower its toxicity. If successful, the majority of produced water which is currently injected underground, or that does not meet present discharge limits, would be treated to meet discharge limits and discharged through a new NPDES permit at the treatment area. This would result in a substantial increase in the amount of surface water discharge at NPR-3. The quality of this water would be equal to or better than that of current discharges.

The process water effluent originating from the deep Tensleep and Madison formations would continue to be hot. Although the temperature at the points-of-discharge would continue to fluctuate as it does presently (Section 3.3.3), the average temperature would not increase. As presently, the in-stream temperature would be expected to rapidly cool to ambient temperatures through atmospheric exchange.

As indicated in Section 4.3.1, minor quantities of surface runoff could reach the streams at NPR-3. Both the quantity and quality of this runoff would be similar to that runoff presently reaching the streams, for which NPR-3 is exempt from industrial source NPDES permitting requirements for surface runoff. Coverage under the general stormwater NPDES permit will be obtained for any facilities constructed which disturb more than 5 acres of ground.

Surface disturbance could result in the sedimentation of the intermittent and ephemeral streams if adequate erosion

control is not practiced.

Spills of oil, produced water or hazardous chemicals could also affect surface water quality.

Mitigation Measures: Corrective action would be taken if any exceedances were noted in the course of monitoring each NPDES-permitted outfall in accordance with permit requirements. Standard erosion control practices selected in consultation with the Casper field office of the SCS would be used to prevent sedimentation of the stream channels. No mitigation measures are necessary to offset minor increases in surface runoff. The existing Spill Prevention Control and Countermeasure Plan would be revised as needed to ensure information is current. Existing spill response procedures would be maintained to ensure that spills are remedied in a timely manner. Finally, field inspections would continue to be performed regularly by Environmental staff to verify clean-up and to check for undetected leaks.

Environmental Consequences of the EOR Technology Alternative: It is not likely that wastewaters generated by EOR activities would be dischargeable. Surface disturbance and sedimentation would also continue to be a potential issue. Therefore, surface water quality impacts would not change from the proposed action, except that impacts from the biological treatment area would not be present under this alternative.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, surface water quality impacts would not change from the proposed action.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the No-Action Alternative: The economic life of the project would be shortened considerably. Tensleep formation discharges would cease earlier than expected in the Proposed Action. All NPDES permits would be deactivated as part of the early decommissioning process.

Mitigation Measures: Mitigation measures would include continued use of Madison water supply wells to make up for lost oilfield discharges.

Environmental Consequences of the Decommissioning Alternative: Tensleep formation discharges would cease immediately. All NPDES permits would be deactivated as part of the immediate decommissioning process.

Mitigation Measures: Mitigation measures would include continued use of Madison water supply wells to make up for lost oilfield discharges.

4.3.4 Ground Water Quality

Environmental Consequences of the Proposed Action: Steamflooding and waterflooding EOR activities using water from the Madison and Tensleep formations would locally dilute the formation water present with the hydrocarbons in the various oil producing formations at NPR-3. This dilution is not expected to render water in the shallow formations at NPR-3 suitable for potable purposes. As indicated in Section 3.3.4, the TDS level of Madison formation water, the highest quality groundwater present at NPR-3, renders it of marginal quality as potable water. Due to its depth, the quality of Madison formation water could not potentially be affected by activities at the surface or by the UIC-permitted injection wells.

Surface facilities such as reserve pits and disposal ponds could contaminate soil and local shallow groundwater. Spills of crude oil and other chemicals may have the same effect.

Mitigation Measures: Reserve pits and other production facilities would be designed, sited, constructed and operated according to WOGCC standards for critical areas (Rule 401) as applicable. The NPR-3 SPCC Plan would be regularly revised to ensure that it remains current. Existing spill response procedures would be maintained in order to ensure that spills are remedied in a timely manner. Finally, field inspections by Environmental staff would continue to be

conducted regularly in order to verify clean-up and to check for undetected leaks.

Underground Injection Control wells for water injection, water disposal and steam injection would be tested for casing integrity in accordance with WOGCC regulations for UIC injection.

Finally, routine groundwater monitoring would continue around the NPR-3 landfill.

Environmental Consequences of the other Alternatives: Consequences of the other alternatives are similar to those of the Proposed Action.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

4.3.5 Potable Water

Environmental Consequences of the Proposed Action: The potable water demands of NPR-3 would not increase due to the Proposed Action. Water would continue to be provided from the Casper and Midwest municipal systems and monitored as it is presently.

Mitigation Measures: Mitigation measures are not necessary to offset the limited use of potable water attributable to the Proposed Action.

Environmental Consequences of the other Alternatives: Potable water requirements at NPR-3 would change slightly as a result of adoption of any of the alternatives, but operation and monitoring of the potable water system would continue unchanged until decommissioning.

Mitigation Measures: Mitigation measures are not necessary to offset the limited use of potable water attributable to any of the alternatives.

4.4 Geology, Soils, and Prime and Unique Farmlands

4.4.1 Geology

Environmental Consequences of the Proposed Action: Other than the removal of oil from oil-bearing strata, no part of the Proposed Action would alter the geology of NPR-3 or the surrounding area. Because the oil-bearing strata are consolidated and not susceptible to consolidation (Doyle, 1993), there is no potential for sinkholes or land subsidence resulting from oil and water extraction.

Mitigation Measures: Since oil and water extraction at NPR-3 has no potential to result in adverse impacts, no mitigation measures are necessary.

Environmental Consequences of the other Alternatives: No impacts to the geology of NPR-3 would result from adoption of any of the alternatives.

Mitigation Measures: Because the alternatives would not adversely affect the local geology, no mitigation measures are necessary.

4.4.2 Soils

Environmental Consequences of the Proposed Action: Many activities under the Proposed Action would involve limited areas of surface soil disturbance. Surface soil disturbance would result in the removal of the generally thin topsoil and expose the highly alkaline and saline subsoils found throughout most of NPR-3. The exposed subsoils would be highly prone to erosion during the infrequent but intense downpours typical of eastern Wyoming. The SCS has determined that the majority of the soils mapped on the upland plains at NPR-3 present a severe hazard of water

erosion (Figure 3-4 and Table 3-3).

Livestock grazing would increase soil compaction and erosion. The impacts would be most evident in bedding areas and along the trails the sheep would use. Some impacts would be noted in riparian areas, however these would be limited since grazing would be limited to spring when water demands are lower.

Since no part of the Proposed Action would involve more than scattered areas of surface disturbance and because most surface disturbing activities would not be performed simultaneously, large-scale soil erosion would not be anticipated. Furthermore, the surface disturbance would be very shallow and would not involve the redistribution or removal of large quantities of soil. The greatest potential for erosion could result from the implementation of new and expanded EOR activities. EOR activities (including steamflooding and waterflooding) could require the grading of contiguous or nearly contiguous areas of as much as 50 acres (20 ha).

Mitigation Measures: Standard erosion control practices selected in consultation with the Casper field office of the SCS would be used to prevent the sedimentation of the draws and other areas down slope of exposed soils. Exposed soils would be vegetatively reclaimed following a reclamation plan developed cooperatively for NPR-3 by the DOE and SCS. The SCS issued a list of recommended reclamation procedures for NPR-3 in 1992 (SCS, 1992), which would be followed until a sitewide reclamation plan is developed. To mitigate the impacts of livestock grazing, the number of AUMs would be maintained at a low enough level to prevent major impacts. Additionally, grazing activities would be strictly monitored and livestock would be impounded if necessary. A human herder would be required, during daylight hours, to ensure that animals do not congregate too long in any single spot. Areas receiving use beyond their capacities would be isolated until the areas recover. A site-specific grazing management plan would be prepared to discuss the impacts and mitigation measures in detail.

Environmental Consequences of the EOR Technology Alternative: Construction activities in support of EOR activities would result in surface disturbance to an extent and depth approximately equal to that of the Proposed Action. Potential for soil erosion would likewise be similar. No impacts would be felt from livestock grazing.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, soil impacts would not change from the proposed action. Increased soil erosion due to overgrazing and erosion due to unrestricted damage to riparian areas could increase.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the No-Action Alternative: New construction would be minimal and additional surface disturbance would be negligible. Soil erosion from new construction would not occur. Reclamation of abandoned wells and facilities would accelerate.

Mitigation Measures: To the limited extent necessary, mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Decommissioning Alternative: The project site would immediately begin decommissioning and restoration. Most surface occupancy would end. Leasing of the property for livestock grazing is possible.

Mitigation Measures: Mitigation of grazing impacts would be similar to those under the Proposed Action.

4.4.3 Prime and Unique Farmlands

Environmental Consequences: Because no prime or unique farmlands are present within NPR-3 (Davis, 1993b), no part of the Proposed Action has any potential for impact.

Mitigation Measures: As there are no prime farmlands present on or in the vicinity of NPR-3, no mitigation measures

are necessary.

Environmental Consequences of the other Alternatives: None of the proposed alternatives has any potential for impact because no prime or unique farmlands are present within NPR-3.

Mitigation Measures: As there are no prime farmlands present on or in the vicinity of NPR-3, no mitigation measures are necessary.

4.5 Biological Resources

4.5.1 Aquatic Biology

Environmental Consequences of the Proposed Action: Ground disturbance under the Proposed Action could result in increased sedimentation of streams at NPR-3. While NPDES discharges have remained within the permitted effluent limits, a hydrocarbon sheen has been observed on containment ponds. The hydrocarbon sheen on ponds poses a toxicity threat to water birds (e.g. ducks, shorebirds) and other species attracted to these water sources.

Although the WGFD does not anticipate any direct impacts to any fisheries, the agency has expressed concern that the potential level of activity under the Proposed Action could magnify water quality impacts in the Powder River system. The Powder River is already impacted by poor water quality from other sources, and the river provides important habitat for sturgeon chubs and shovelnose sturgeon. However, as discussed in Section 4.3.3, the use of a biological treatment area for the treatment of produced water may actually improve the quality of water discharged, thereby offsetting impacts to the Powder River system.

Mitigation Measures: A soil erosion and sediment control plan would be implemented to prevent increased sedimentation of streams on NPR-3. If containment pond sediments are found to be contaminated, the ponds would be drained and the sediments removed. DOE/FD have contemplated elimination of all containment ponds as a possible mitigative measure. Discharge waters may also be recycled into the steam flooding/water flooding operations or diverted to a UIC disposal well, thus minimizing discharge into surface waters.

Mitigation measures would be developed in consultation with the WGFD. To ensure that impacts to fisheries in the Powder River basin are minimized, WGFD has recommended that special precautions be taken to prevent the release of pollutants from work areas at NPR-3. Where effluent must be discharged under existing NPDES permits, WGFD recommends that the creation of appropriately sized wetlands be considered as a means of improving water quality. The DOE is already investigating the use of a biological treatment area as a means of improving the aquatic habitat, and has included this activity in the Proposed Action. Alternately, WGFD would prefer that the effluent be stored where it could not enter surface waters.

Environmental Consequences of the EOR Alternative: Impacts of the EOR Alternative on surface water quality and quantity have been discussed previously. Kinds of impacts that may be expected as a result of implementing the alternative is similar to the Proposed Action, although the magnitude would vary slightly.

Mitigation Measures: Mitigation measures employed to protect aquatic biological resources would be similar to those of the Proposed Action.

Environmental Consequences of the Divestiture Action Alternative: Impacts of the Divestiture Alternative on surface water quality and quantity have been discussed previously. Kinds of impacts that may be expected as a result of implementing the alternative are similar to the Proposed Action, although the magnitude would vary slightly.

Mitigation Measures: Mitigation measures employed to protect aquatic biological resources would be similar to those of the Proposed Action.

Environmental Consequences of the No-Action Alternative: As facilities and wells are shut in the amount of produced water discharged would gradually decrease. This would have an effect on the streams and wetlands at NPR-3, and may

also have a negative effect on the aquatic organisms.

Mitigation Measures: Mitigation measures employed to protect aquatic biological resources would be similar to those of the Proposed Action.

Environmental Consequences of the Decommissioning Alternative: As facilities and wells are shut in the discharge of produced water would cease. This would have a profound effect on the streams and wetlands at NPR-3 and their associated aquatic organisms.

Mitigation Measures: Mitigation measures employed to protect aquatic biological resources would be similar to those of the Proposed Action.

4.5.2 Terrestrial Vegetation

Environmental Consequences of the Proposed Action: Where surface disturbance is necessary to implement activities under the Proposed Action, it would result in the removal of existing vegetation. Surface disturbance would be largely limited to the rangeland associations at NPR-3, avoiding areas of riparian and pine-juniper vegetation (Figure 3-5). Small areas of riparian vegetation would be disturbed by certain activities such as road crossings and pipeline and utility installation. Expansion or establishment of EOR activities could potentially require the disturbance of small areas of riparian vegetation. Because developed areas at NPR-3 are highly scattered, incidental encroachment of machinery on areas of rangeland vegetation is inevitable.

Leasing of NPR-3 rangeland for grazing would also have a minor impact on the quantity and quality of vegetation.

Mitigation Measures: Exposed soils would be vegetatively reclaimed following a reclamation plan developed cooperatively by DOE and SCS. The SCS issued a list of recommended reclamation procedures for NPR-3 in 1992 (SCS, 1992), which would be followed until a sitewide reclamation plan could be developed. The number of AUMs would be maintained at a low enough level to prevent major impacts. Additionally, grazing activities would be closely monitored and areas receiving use beyond their capacities would be isolated to allow the areas to recover. A human herder would be required during daylight hours to prevent animals from congregating for too long in a single spot. A Grazing Management Plan would be developed to address impacts, monitoring and mitigation of vegetation quantity.

Environmental Consequences of the EOR Technology Alternative: Surface encroachment and displacement of vegetation would be of a similar magnitude as that of the Proposed Action, although the reasons for construction activity would differ.

Mitigation Measures: Mitigation measures employed to protect vegetation would be similar to those of the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, soil impacts would not change from the proposed action.

Mitigation Measures: Mitigation measures employed to protect vegetation would be similar to those of the Proposed Action.

Environmental Consequences of the No-Action Alternative: New construction would be minimal and additional surface disturbance would be negligible. Displacement of vegetation from new construction would not occur. Reclamation of abandoned wells and facilities would accelerate.

Mitigation Measures: To the limited extent necessary, mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Decommissioning Alternative: Surface disturbance would cease and the project would proceed to restoration of the original prairie. Non-indigenous plant species may be brought into the site in large quantities through reseeding efforts.

Mitigation Measures: Plant species would need to be carefully selected to ensure that indigenous species are used to the largest extent possible.

4.5.3 Terrestrial Wildlife

Environmental Consequences of the Proposed Action: The small areas of vegetation that would be disturbed under the Proposed Action represent a negligible loss of habitat for terrestrial wildlife. Livestock grazing would have a small impact on the amount of vegetation available for wildlife. The greatest impact would be to native grasses. Increased activity in localized parts of NPR-3 would not impact the pronghorn antelope and mule deer populations, whose natural mobility allows for movement throughout NPR-3 and adjoining undisturbed lands. The less mobile wildlife species (amphibian, reptiles and small mammals) could be killed by land disturbances.

Noise generated by activities under the Proposed Action would be generally consistent with noise generated by existing activities at NPR-3. Workers at NPR-3 have noticed that antelope and deer at NPR-3 have become conditioned to the noise (Halliburton NUS, 1993). Noise levels associated with oil drilling activities, such as those already present at NPR-3 and those proposed under the Proposed Action are not unusually high for industrial activities. Noise generated by construction under the Proposed Action would be minimal. Ambient drilling noise 50 feet (15 m) from a drill rig has been recorded at 75 dbA (DOE, 1990).

Produced water discharged to the draws under existing NPDES permits meets the Water Quality Standards established by the WYDEQ. However, the oil films which form on oil pits and the hydrocarbon sheen observed on containment ponds could be hazardous to wildlife, especially birds. Wildlife could be attracted to these pits and containment ponds as a source of drinking water or to retrieve insects trapped and struggling on the oily surface (Esmoil, 1991). Hydrocarbons could adhere to the feathers of parent birds and poison the bird while preening or contaminate and kill eggs during breeding. Complete net covering is a reliable deterrent to contamination of wildlife (Esmoil, 1991).

There is a potential for hydrogen sulfide (H_2S) generated during steamflooding and waterflooding operations to cause localized wildlife mortality. In one study, 237 animal deaths were attributed to H_2S gas (Esmoil, 1991); however, no wildlife mortality has been attributed to H_2S gas at NPR-3. In many oilfields this gas is vented through flare stacks (Esmoil, 1991) and most of the H_2S produced at NPR-3 is flared.

Mitigation Measures: No mitigation measures are necessary to compensate for the minor losses of wildlife habitat or increases in noise that would result from the Proposed Action. Impacts from livestock grazing would be mitigated by maintaining the number of AUMs at a low enough level to prevent major impacts, and closely monitoring grazing activities in accordance with the attached Grazing Management Plan.

Mitigation measures for hydrocarbon exposure would be developed in consultation with the FWS and the WGFD. The FWS has recommended that protective netting be placed over all containment ponds and any receiving wetlands displaying a hydrocarbon sheen, to prevent exposure of wildlife to oil. Most of the containment ponds would be closed, and the remaining few would be netted. One pond, located at the Tensleep battery was netted during the Summer of 1994.

It would be impossible to prevent dissipation of H_2S gas in areas where flare stacks are not used. When flare stacks are used, H_2S -caused wildlife mortality could be reduced by ensuring that igniters are operating efficiently so that the gas is properly flared and not vented directly into the environment. Also devices may be installed to inhibit raptors and other birds from perching on flares (Esmoil, 1991).

Environmental Consequences of the EOR Technology Alternative: The potential impacts due to noise and hydrocarbon emissions would be similar to those of the Proposed Action. The generation of hydrogen sulfide gas would decrease with time as the existing steam injection patterns became uneconomic to operate. Encroachment on habitat by construction is also of a similar magnitude to that of the Proposed Action, although the reasons for construction would differ.

Mitigation Measures: Mitigation measures would be largely similar to those in the Proposed Action. The decrease in production of hydrogen sulfide gas would require no mitigation.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, impacts to wildlife would be similar to the Proposed Action.

Mitigation Measures: Mitigation measures employed to protect wildlife would be similar to those of the Proposed Action.

Environmental Consequences of the No-Action Alternative: The potential impacts due to noise and hydrocarbon emissions would start as being similar to those of the Proposed Action, but they would decrease over time as operations cease to be profitable. The generation of hydrogen sulfide gas would decrease with time as the existing steam injection patterns became uneconomic to operate. Encroachment on habitat by construction is also of a similar magnitude to that of the Proposed Action, although the reasons for construction would differ.

Mitigation Measures: Mitigation measures would be largely similar to those in the Proposed Action. The decrease in production of hydrogen sulfide gas would require no mitigation. Accelerated reclamation of oilfield pits and other facilities hazardous to wildlife would require no mitigation.

Environmental Consequences of the Decommissioning Alternative: Since current operations would be curtailed immediately, oilfield facilities that are hazardous to wildlife would immediately shut down and be promptly reclaimed.

Mitigation Measures: Mitigation of impacts under the Decommissioning Alternative would not be required, since the impacts would not be adverse to wildlife.

4.5.4 Threatened and Endangered Species

Environmental Consequences of the Proposed Action: There are no Federally-listed threatened or endangered species known to consistently inhabit NPR-3. Since the bald eagle and peregrine falcon (both endangered) are rare migrants, and the black-footed ferret is believed to be absent from the area (endangered), none of these species would be impacted by the Proposed Action.

Most of the Federal candidate species, although they occur in the region of NPR-3, are not known to exist at the NPR-3 site and thus are not expected to be affected. Since NPR-3 lies within the breeding range and contains suitable habitat for both the mountain plover (Category 1) and ferruginous hawk (Category 2), a field verification for nests of these species may be necessary prior to any disturbance of previously undisturbed land.

The loggerhead shrike (Category 2) is the only special status species known to occur regularly at NPR-3. Loggerhead shrikes, especially the young, have been shown to be vulnerable to oil contamination from oil pits in Wyoming (Esmoil, 1991).

The sturgeon chub (Category 2) and shovelnose sturgeon (Site Sensitive) are not known to occur at NPR-3. The distribution of the narrow-foot hygrotus diving beetle (Category 2) is unknown at NPR-3. The environmental consequences and mitigation measures applicable to these species are discussed in Section 4.5.1.

Mitigation Measures: Prior to the disturbance of any previously undisturbed land within mostly undeveloped areas of NPR-3, field surveillance would be conducted to determine whether Barr's milkvetch or nests of the ferruginous hawk, mountain plover or loggerhead shrike are present. A survey for the black-footed ferret would be performed before any prairie dog colonies are disturbed. Prior to the disturbance of any lands within the draws on NPR-3, a survey would be performed to determine whether the narrowfooted hygrotus diving beetle is present. In such a case guidance would be sought from FWS. Oilfield pits would be netted as funding becomes available in order to protect all migratory birds from harm.

Environmental Consequences of the other Alternatives: Continued operations under any of the proposed alternatives

would result in impacts similar to those of the Proposed Action. The difference would be in the remaining life of the project, and the time until the project site would be returned to its former condition.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action while operations continued. The restoration of the project after termination of operations would require no mitigation.

4.5.5 Floodplains and Wetlands

Environmental Consequences of the Proposed Action: Surface disturbance within the draws at NPR-3 would be largely limited to road crossings and to pipeline and utility installation. Additional surface disturbance would be caused by the increased use that wetlands would receive by livestock. These activities would not result in any permanent modification to the flood carrying properties of the affected draws. Small increases in the area of impervious surfaces within NPR-3 would not generate enough increased surface runoff during the 100-year or 500-year flood events to alter the area of the floodplains. Expansion or establishment of EOR activities could potentially require the filling of small swales. The impact on the floodflow capacity of the down slope draws would be minor.

Because encroachment into the draws would be minimal, the loss of wetlands from activities under the Proposed Action would be minimal. The only water bodies at NPR-3 that could possibly be filled under the Proposed Action would be process water containment basins, which do not meet the EPA definition of wetlands.

Wetlands in the draws could experience some change in the discharges of produced water released in accordance with NPDES permits. These wetlands already experience such discharges, and many areas of wetlands within the draws owe their existence to the NPDES discharges. Closure of existing or future wells by DOE, when they become uneconomic, would result in a decrease in water discharges under the NPDES permits and could result in the shrinkage or elimination of some wetlands. Development of a biological treatment area, which would treat and discharge most of the produced water at NPR-3, could create additional wetlands. Alternatively, the drilling of additional Tensleep wells could increase water discharges.

Sheep could damage riparian areas where they congregate to graze and cross creeks. Concentrated livestock grazing could beat down stream banks, foul surface waters, and damage riparian vegetation. However, the impacts to riparian areas would be less in the springtime, when grazing is planned, due to lesser water demands than the livestock would have during the summer months.

Mitigation Measures: In compliance with Executive Orders 11988 and 11990, DOE would investigate all practicable alternatives meeting the objectives of its mission at NPR-3 prior to even minor modifications to wetlands or floodplains. If an activity under the Proposed Action required permanent changes to the grade within a draw, the boundaries of the affected floodplain would be delineated, and the impact to the 100-year flood flow would be calculated using standard hydrological procedures.

If an activity under the Proposed Action required any temporary or permanent surface disturbance within a draw, DOE would delineate the boundaries of any affected wetlands using the Corps of Engineers Wetlands Delineation Manual (COE, 1987). It is expected that required wetland fill would qualify for Nationwide General permits under Section 404 of the Clean Water Act. The US Army Corps of Engineers (COE) would be notified in writing prior to any discharge of fill material to wetlands at NPR-3. If required, mitigation measures would be developed in consultation with the COE.

The number of AUMs would be maintained at a low enough level to prevent major impacts from livestock grazing. Additionally, grazing activities would be closely monitored, and areas receiving use beyond their capacities would be isolated to allow the areas to recover. Livestock would be closely supervised near riparian areas in order to prevent overutilization of these sensitive ecosystems. A site-specific grazing management plan would be prepared that discusses the impacts and mitigation measures in detail.

Environmental Consequences of the other Alternatives: Construction activities under the other alternatives would also be conducted in manner similar to that of the Proposed Action, in that wetlands would be generally avoided.

Discharges of produced water would generally decrease with time, as production became uneconomic. None of the alternatives proposes drilling of additional wells in the Tensleep formation, which would increase water discharge volumes. None of the alternatives offers a project life as long as the Proposed Action, therefore wetlands would be adversely affected earlier.

Mitigation Measures: During operation of the project, mitigation would be similar to that of the Proposed Action. After reclamation, mitigation of lost wetlands would include the construction of nearby wetlands as compensation. Alternatively, the Madison water supply wells could continue to produce water and feed the existing wetlands at NPR-3.

4.6 Cultural Resources

Environmental Consequences of the Proposed Action: Impacts to cultural resources from the Proposed Action would be largely limited to the effects of ground disturbing activities. Under Section 106 of the National Historic Preservation Act (16 USC 470 and 36 CFR 800), Federal agencies (including the DOE) must consider the effects that actions would have on historic properties. As part of the Section 106 process, Federal agencies must consult with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation.

The Wyoming SHPO was consulted during the preparation of this Sitewide EA. The SHPO records indicate that much of NPR-3 was surveyed prior to 1980. However, surveys conducted prior to 1980 are considered unreliable by the SHPO. The SHPO has recommended that, prior to disturbance of previously undisturbed ground, a new archaeological survey be completed and the results sent to the SHPO. (Keck, 1993)

Because the specific locations of ground disturbing activities under the Proposed Action have not yet been identified, the Advisory Council on Historic Preservation and the Wyoming SHPO were not consulted concerning specific sites.

A Class III cultural resources inventory was completed for NPR-3 in June 1995. The inventory revealed two prehistoric sites which are eligible for listing on the National Register of Historic Places. Both sites are located in the southern end of the field in areas which are undesirable for drilling. Therefore, no impacts to the sites are expected. The oilfield itself is also eligible for listing as an historic site. Operation of NPR-3 as an oilfield is consistent with the history and setting of Teapot Dome, therefore there would be no effect to the site.

Mitigation Measures: The two eligible prehistoric sites would be avoided as potential development areas. A Programmatic Agreement (PA) would be developed to cover mitigation of potential impacts to the cultural resources found in the survey and to address the potential for ground disturbing activities to uncover cultural resources.

Should additional resources be found, avoidance of these resource areas would be the preferred mitigation. If cultural resources are identified, measures outlined in the Cultural Resources Management Plan (JBEC, 1991) would be followed. If avoidance of these resources is not feasible, techniques to preserve these natural resources could include data recovery and documentation. The Wyoming SHPO and/or Tribal Council would be notified if resources were identified. The discovery of cultural resources would result in work stopping immediately until an experienced individual could determine the eligibility of the site under the NHPA and associated laws.

Environmental Consequences of the EOR Technology Alternative: Construction under the EOR Technology Alternative would be of the same order of magnitude as the Proposed Action. Therefore, the potential impacts to cultural resources would be similar.

Mitigation Measures: Mitigation measures would be similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, impacts to cultural resources would not change from the proposed action. However, because the operation would presumably utilize private funding on private land, the level of compliance required by Section 106 would be much less, if required at all.

Mitigation Measures: Mitigation measures employed to protect cultural resources might include covenants in the sale contract requiring protection of cultural resources.

Environmental Consequences of the No-Action Alternative: New construction under the No-Action Alternative would be halted. Only minor surface disturbance would occur until decommissioning of the field.

Mitigation Measures: A Section 106 consultation would be performed to address mitigation of potential impacts to the cultural resources that might still occur as a result of the limited operations.

Environmental Consequences of the Decommissioning Alternative: All activities at NPR-3 would be halted and the property would be promptly restored to its former state. No further disturbance of the surface would occur. Possible sale and dismantling of equipment and buildings could impact the integrity of the Teapot Dome site.

Mitigation Measures: A Section 106 consultation would be performed to address mitigation of potential impacts to the cultural resources that might still occur as a result of the limited operations.

4.7 Socioeconomics

4.7.1 Population and Employment

Environmental Consequences of the Proposed Action: Under the Proposed Action, employment at NPR-3 would remain at or close to the present levels. Minor fluctuations would be expected in response to project scheduling and political and economic shifts. FD (DOE's prime contractor for NPR-3) presently employs a work force of about 65 at NPR-3. As many as 20 additional persons hired by subcontractors to FD are working at NPR-3 at any given time. FD bases an additional staff of about 45 at the Casper office, which is responsible for the oversight of field operations both at NPR-3 and at the Naval Oil Shale Reserves (NOSRs) in Colorado and Utah. DOE maintains a staff of 15 in Casper for the oversight of NPR-3 and the NOSRs.

Mitigation Measures: Because the Proposed Action would not substantially change regional population or employment levels, no mitigation measures are necessary.

Environmental Consequences of the EOR Technology Alternative: Employment levels under this Alternative would not change substantially from that of the Proposed Action.

Mitigation Measures: Because this Alternative would not substantially change regional population or employment levels, no mitigation measures are necessary.

Environmental Consequences of the Divestiture Alternative: Private ownership of NPR-3 would result in a level of activity substantially unchanged from that of the proposed action, but a private operator would not likely use as large a work force to accomplish its goals. Unemployment would increase in Natrona County and adverse impact to the towns of Midwest and Edgerton would likely result.

Mitigation Measures: Although an adverse impact on employment levels might result, no mitigation of this Alternative would be possible because the new operator would not be under any obligation to mitigate staff reductions. However, it might be possible to incorporate such provisions into the sale contract.

Environmental Consequences of the No-Action Alternative: Employment levels would generally decline since oil production rates would begin to decline almost immediately.

Mitigation Measures: Job retraining and severance benefits would be awarded to those employees who are displaced as a result of declining activity at NPR-3.

Environmental Consequences of the Decommissioning Alternative: Adverse impact to the towns of Midwest and Edgerton would be immediate. A substantial portion of these towns' small employment pools are provided by NPR-3.

Mitigation Measures: Qualified employees would be offered positions for the decommissioning and reclamation work. Job retraining and severance benefits would be awarded to those employees who are displaced as a result of declining activity at NPR-3, and for the remainder of the work force after reclamation is complete.

4.7.2 Housing

Environmental Consequences of the Proposed Action: Because the Proposed Action would not substantially change employment levels at NPR-3, the supply of housing units in Natrona County would not be affected. Considering the high vacancy rate for housing units in Natrona County, any short-term increases in the demand for housing could easily be accommodated.

Mitigation Measures: Because of the adequacy of regional housing, no mitigation measures are necessary.

Environmental Consequences of the EOR Technology Alternative: No impacts to the local availability of housing would result from adoption of any of the Alternatives.

Mitigation Measures: Because of the adequacy of regional housing, no mitigation measures are necessary.

Environmental Consequences of the Divestiture Alternative: Private ownership of NPR-3 would likely reduce the size of the workforce and could in turn result in a decline in the housing values in Midwest, Edgerton and Casper.

Mitigation Measures: Although this would be an adverse impact no mitigation of this alternative would be possible because the new operator would not be under any obligation to maintain staffing levels.

Environmental Consequences of the No-Action Alternative: As employment levels decline with the oil production a slight effect might be seen in local housing values.

Mitigation Measures: This effect could not be mitigated.

Environmental Consequences of the Decommissioning Alternative: Because a significant portion of the positions at NPR-3 would be eliminated immediately this alternative would have an immediate effect on housing values in the area.

Mitigation Measures: This effect could not be mitigated.

4.7.3 Transportation

Environmental Consequences of the Proposed Action: Transportation of heavy machinery and materials to and from NPR-3 using Interstate 25 and Wyoming Route 259 would be necessary under the Proposed Action. Because the current level of service on these roads is substantially below capacity, no disruption of traffic flow would occur as a result.

Mitigation Measures: Because of the adequacy of regional transportation facilities, no mitigation measures are necessary.

Environmental Consequences of the other Alternatives: Highway traffic resulting from the adoption of any of the alternatives would be less than or approximately equal to that resulting from the Proposed Action.

Mitigation Measures: Because of the adequacy of regional transportation facilities, no mitigation measures are necessary.

4.7.4 Community Services

Environmental Consequences of the Proposed Action: Because employment and population levels are expected to

remain generally constant under the Proposed Action, community services in Natrona County would not be affected.

Mitigation Measures: Because of the adequacy of regional community services, no mitigation measures are necessary.

Environmental Consequences of the other Alternatives: Employment and population levels resulting from the adoption of any of the alternatives would be less than or approximately equal to that resulting from the Proposed Action.

Mitigation Measures: Because of the adequacy of regional community services, no mitigation measures are necessary.

4.8 Waste Management

Environmental Consequences of the Proposed Action: Generation of hazardous waste is expected to decline. Product substitution and process changes have been successful in reducing hazardous waste generation despite relatively constant levels of activity.

Starting in Fiscal Year 1994, the bulk of the solid waste began to be hauled offsite by a commercial hauler. With that arrangement and the NPR-3 landfill permit still active, disposal capacity for solid wastes would be adequate for the foreseeable future.

High level radioactive waste is not expected, but might be generated by an accident involving sealed radioactive sources. Naturally Occurring Radioactive Materials (NORM) would be present in production equipment in extremely low levels that would be below proposed state and Federal regulations.

Pesticides are not expected to be intentionally dispose, but may also be spilled or accidentally released into the environment.

Mitigation Measures: Mitigation measures for hazardous substances would include waste minimization, product substitution and the monitoring of usage to ensure compliance with applicable laws and regulations. Proper disposal of all hazardous and non-hazardous materials would be ensured by training and environmental compliance audits.

Mitigation for high level radioactive and pesticide wastes would include training and operational procedures intended to prevent accidental releases. Prompt and effective spill response would minimize the quantity of waste generated in the event of a release.

NORM would be mitigated by continuing to assess the extent of its occurrence at NPR-3. If it is found to be at regulated levels, a scale prevention program would be investigated as a means to prevent the deposition of NORM-containing carbonate/sulfate scale. Inspection procedures would ensure that contaminated equipment is discovered, decontaminated, and that disposal of the NORM debris is properly administered.

Environmental Consequences of the EOR Technology Alternative: Work levels and waste generation rates under this Alternative would be similar to that of the Proposed Action.

Mitigation Measures: Mitigation measures would also be similar to those in the Proposed Action.

Environmental Consequences of the Divestiture Alternative: Operation by private industry would continue largely unchanged from current practices. Therefore, volumes of waste generated would not change from the proposed action.

Mitigation Measures: Private industry would be required to meet the same local regulations, therefore no mitigation is necessary.

Environmental Consequences of the No-Action Alternative: Waste generation rates would slowly decrease from current levels as the project becomes uneconomic due to declining oil production rates. At the point of decommissioning, generation rates for all types of wastes would dramatically increase as facilities are dismantled.

Mitigation Measures: Mitigation measures would also be similar to those in the Proposed Action during the operating

phase. At decommissioning, a priority would be placed on salvaging and auctioning the decommissioned equipment. Other materials would be recycled as market conditions permitted.

Environmental Consequences of the Decommissioning Alternative: At the point of de-commissioning, generation rates for all types of wastes would dramatically increase as facilities are dismantled. Current pesticide inventory would be disposed of if it could not be sold, donated, or returned to the vendor.

Mitigation Measures: At decommissioning, a priority would be placed on salvaging and auctioning the decommissioned equipment. Other materials would be recycled as market conditions permitted.

4.9 Summary of Environmental Consequences and Mitigation Measures of Proposed Action

Impacts to each resource area potentially resulting from implementation of the Proposed Action are summarized in Table 4-1. Where mitigation measures are necessary to ensure that no potentially adverse impacts to any resource area result from the Proposed Action, they are listed in the adjacent column in Table 4-1.

Table 4-1
Summary of Environmental Consequences
of the Proposed Action
and Proposed Mitigation Measures

Resource	Section	Environmental Consequences	Proposed Mitigation Measures
LAND RESOURCES	4.1	See below	See below
Land Use	4.1.1	Minor land disturbances would result from many activities under the Proposed Action. As much as 30 acres (12 ha) of disturbance could be required for each new steamflood system site. Total land disturbance would total less than 250-300 acres (100-120 ha), mostly concentrated near the center of NPR-3. Minor land disturbances would also result from livestock grazing.	Areas of surface disturbance would be reclaimed using procedures recommended by the U.S. Soil Conservation Service. A Grazing Management Plan would be developed detailing impacts and mitigation.
Aesthetics	4.1.2	No potential for profound impacts.	No mitigation necessary.
Recreation	4.1.3	No potential for profound impacts.	No mitigation necessary.
AIR QUALITY AND ACOUSTICS	4.2	See below	See below

Meteorology and Climate	4.2.1	No potential for profound impacts.	No mitigation necessary.
Air Quality	4.2.2	Minor increases in emissions (primarily H ₂ S from steamflooding and waterflooding operations) would result. Temporary, minor increases in fugitive dust would result from construction activities. Stack emissions from steam generators and other sources would be maintained within permitted levels.	Although all air emissions would be maintained within permitted levels, continued development would control H ₂ S production through use of flare facilities and microbial and/or chemical treatment of wells and/or produced gas. Obtain a Clean Air Act Title V permit to regulate air emissions.
Acoustics	4.2.3	Minor increases in noise levels from construction and drilling operations would be temporary and would not noticeably alter the existing acoustic levels at NPR-3.	No mitigation necessary.
WATER RESOURCES	4.3	See below	See below
Surface Water Quantity	4.3.1	The quantity of effluent discharged to surface water on NPR-3 may increase with the operation of a biological treatment area. The quality of the water should improve with the biotreatment area.	No mitigation necessary.
Ground Water Quantity	4.3.2	Water would continue to be withdrawn from oil-bearing strata and from Madison formation. Water from all formations underlying NPR-3 is unsuitable for potable use.	No mitigation necessary, except for UIC casing-integrity tests.
Surface Water Quality	4.3.3	No changes are proposed to the effluent limits in the existing NPDES permits. Use of a biological treatment area should improve discharge water quality. There is a potential for sedimentation of	Standard sediment and erosion control practices developed in consultation with the U.S. Soil Conservation Service would

		streams caused by erosion from soils exposed by construction activities.	be followed.
Ground Water Quality	4.3.4	Aquifers exist that may be used for livestock and wildlife. These aquifers require protection to the level of their use, regardless of water quality.	UIC casing-integrity tests. Facility siting and construction standards, SPCC Plan, and spill response procedures
Potable Water	4.3.5	No potential for profound impacts.	No mitigation necessary.
GEOLOGY AND SOILS	4.4	See below	See below
Geology	4.4.1	No potential for land subsidence or other profound impacts.	No mitigation necessary.
Soils	4.4.2	Ground disturbing activities would expose small areas of soils to erosion and would result in loss of topsoil and mixing of subsurface soil horizons. Minor land disturbances would also result from livestock grazing.	Areas of surface disturbance would be reclaimed using procedures recommended by the U.S. Soil Conservation Service. A Grazing Management Plan would be developed detailing impacts and mitigation.
Prime Farmlands	4.4.3	No potential for profound impacts since no prime farmlands are present.	No mitigation necessary.
BIOLOGICAL RESOURCES	4.5	See below	See below
Aquatic Biology	4.5.1	Macroinvertebrates, minnows, and other small aquatic biota present in the streams could be affected by the elevated water temperatures at the NPDES discharge points. No profound impacts to aquatic biota in streams downstream of NPR-3 are expected.	A soil erosion and sediment control plan would be implemented to prevent increased sedimentation of streams.
		Rangeland vegetation would be disturbed	Areas of surface disturbance would be reclaimed using

Terrestrial Vegetation	4.5.2	wherever ground disturbance under the Proposed Action occurs. No forested areas would be disturbed. Minor impacts to vegetation would also result from livestock grazing.	procedures recommended by the U.S. Soil Conservation Service. A Grazing Management Plan would be developed detailing impacts and mitigation.
Terrestrial Wildlife	4.5.3	Oil films and sheens in oil pits and containment ponds could adversely affect wildlife, especially birds. Grazing would reduce the amount of forage present for wildlife.	Oil pits and containment ponds would be netted or eliminated within 3 years. The number of animals allowed to graze at NPR-3 would be closely monitored and severely impacted areas isolated from use. A Grazing Management Plan would be developed detailing impacts and mitigation.
Threatened and Endangered Species	4.5.4	There is no potential for profound impacts due to the infrequent occurrence of listed species.	No mitigation necessary.
Floodplains and Wetlands	4.5.5	Construction in floodplains and wetlands would be limited to road, utility, and pipeline crossings and related structures. Surface topography within floodplains would not be notably modified. Minor land disturbances would also result from livestock grazing, especially near riparian areas.	The number of animals allowed to graze at NPR-3 would be closely monitored and severely effected areas isolated from use. A site specific grazing management plan would be developed.
CULTURAL RESOURCES	4.6	Ground disturbing activities could result in disturbance of surface and subsurface cultural resources.	Mitigation measures, if required, would be developed in consultation with the Wyoming SHPO.
SOCIO-ECONOMICS	4.7	See below	See below
Population and Employment	4.7.1	Employment levels are not expected to increase under the Proposed Action.	No mitigation necessary.

Housing	4.7.2	Existing housing supply in Natrona County is adequate to meet any increase associated with the Proposed Action.	No mitigation necessary.
Transportation	4.7.3	Existing transportation facilities serving the area around NPR-3 are under-utilized.	No mitigation necessary.
Community Amenities	4.7.4	Existing community amenities in Natrona County are adequate to meet any increased demand associated with the Proposed Action.	No mitigation necessary.
HAZARDOUS MATERIALS AND HAZARDOUS WASTE	4.8	See below	See below
Hazardous Waste	4.8	NPR-3 would remain a conditionally exempt small quantity generator (CESQG) under the proposed Action.	No mitigation necessary.
Pesticides	4.8	Pesticide usage would remain limited to occasional use of small quantities of properly labeled insecticides and herbicides as necessary. Potential for spills and other accidental releases.	Procurement and inventory control to minimize quantities. Training and operational procedures to minimize spills. Emergency Response Plan.
Radioactive Waste	4.8	Small quantities of NORM (naturally occurring radioactive materials). Potential for accidental release of sources.	The program to evaluate NORM issues would continue with added parameters.
Waste Disposal	4.8	The Proposed Action would increase the quantity of waste entering the solid waste landfill.	Most solid waste would be hauled offsite. However, the NPR-3 landfill would be kept open to allow continued use of the landfarm for oil-contaminated soil.

4.10 Cumulative Impacts of the Proposed Action and Alternatives

The cumulative impacts of continued development under the Proposed Action are expected to be minimal. Most areas within NPR-3 have previously been used for petroleum development and extraction, and activities would be concentrated within an already existing area of intensive oilfield development. Additionally, although 250 wells are proposed to be drilled over the next five years, approximately the same number of existing wells would be plugged and abandoned, so that the overall number of operating wells would not increase. By employing environmentally sound design, engineering, and mitigation practices, adverse impacts associated with continued development of NPR-3 would be reduced and made relatively short-term. The relative remoteness of NPR-3 from population centers and other sensitive environmental resources lessens the likelihood of cumulative impacts occurring to either the human or natural environment.

The cumulative impacts of the EOR Technology Alternative would be similar to those of the Proposed Action. The EOR techniques would affect those areas of NPR-3 where production efforts are currently underway. The various well stimulation techniques proposed under this alternative would change the types of air emissions, namely increasing the amount of carbon dioxide released. By using environmentally sound engineering and mitigation practices, the impacts associated with this alternative would also be reduced.

Divestiture of NPR-3 would produce individual impacts similar to those of the Proposed Action in regard to environmental concerns, however, the socioeconomic impacts would be greater. The methods that would be used by a private operator to manage NPR-3 would be similar to those proposed under the Proposed Action, but the number of employees required would be less. The resultant impacts from a reduction in force would be felt by all of the surrounding communities.

The greatest cumulative impact from the Divestiture Alternative, however, would be the difficulty in ensuring mitigation of the impacts of routine oilfield operation. Effects that would be detrimental to the environment, but that are not regulated by Federal, state or local laws, would be difficult, if not impossible, to mitigate even through covenants attached to the sale of the property.

The environmental impacts of the No-Action Alternative would slowly decrease as wells and facilities were shut in and abandoned. Coinciding with the decrease in environmental impacts would be a rise in socioeconomic impacts from the resultant reduction in force. Again, the reduction of staffing levels at NPR-3 would have a negative effect on the economy of the surrounding communities, especially Midwest and Edgerton. Although most of these impacts could be mitigated through career placement programs and other methods, the impacts to local housing values could not be mitigated. Additionally, the No-Action Alternative would not be consistent with the Congressional mandate to operate NPR-3 at the MER.

The cumulative impacts of the Decommissioning Alternative would be similar to those of the No-Action Alternative, except that the rates of all impacts would be increased. Under this alternative, operations at NPR-3 would cease immediately. Therefore, negative impacts to the socioeconomics of the region would also be immediate. Although most of these impacts could be mitigated through career placement programs and other methods, the impacts to local housing values could not be mitigated.

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APPENDIX A - RESPONSE TO COMMENTS

The following concerns and comments were noted during the public comment phase. Each issue is listed below and is immediately followed by a response, in bold. Copies of all letters received appear at the end of this section.

Issues 1 through 4 were raised by the Wyoming Department of Environmental Quality.

1a. The first issue pertains to the potential for contamination of soil, groundwater, and surface water from reserve pits and disposal activities during drilling, and from waste water treatment and disposal ponds during production activities. This concern arises from WQD's responsibility to protect surface and ground water and to resolve violations of the standards when they occur. The Wyoming Oil and Gas Conservation Commission has regulatory authority over the construction, location, operation and reclamation of oil field pits within a lease, unit or communitized area which are used solely for the storage, treatment, and disposal of drilling, production and treater unit wastes; and WQD encourages close coordination with the Commission.

The only reference to groundwater quality is contained in section 3.3.4 entitled "Ground Water Quantity" (page 3-8). The EA indicates that Steele shale occupies the interval from the surface to an approximate depth of 2,000 feet. If there are no shale-isolated marine sand body aquifers with this interval, the EA presents an accurate assessment of groundwater quality and potential use.

There are two porous and permeable sandstone formations within the Steele Shale. The Sussex sandstone outcrops in a ring near the center of the Teapot Dome structure, and does not appear to be an aquifer. The second sandstone body is the Shannon sandstone which is an oil reservoir in much of the field. A fault separates the oil reservoir from the Shannon outcrop at Salt Creek to the north. Groundwater is encountered in the Shannon in some areas north of the fault, but the concentration of Total Dissolved Solids exceeds 10,000 mg/l.

1b. In section 3.3.2 (page 3-7), the discussion of "USDWs" and "or other fresh water aquifers: is confusing. If the groundwater is less than 10,000 mg/l of TDS, it is considered a USDW and a fresh water since both USDW and fresh water must meet the criteria of being less than 10,000 mg/l of TDS.

The statement that "If the groundwater is less than 10,000 mg/l of TDS, it is considered a USDW" is not entirely

correct. Exempted aquifers are not USDW's under the Safe Drinking Water Act, which permits aquifer exemptions for fresh water aquifers being used for Class II injection. Several such aquifer exemptions exist at NPR-3. In addition, aquifers that contain crude oil, natural gas, or other contaminants that make it undesirable for a water supply can also be exempted. Several other aquifers at NPR-3 qualify for exemption under this criteria, although the actual exemption has not been pursued with the Wyoming Oil & Gas Conservation Commission.

As a result, there is a strong distinction at NPR-3 between "fresh water aquifers" and "USDWs". Produced water from oil and gas production is put to beneficial use for livestock and wildlife at NPR-3, but there would be no intention to protect it as a source of municipal water supply. The Madison formation, at the bottom of the geologic column, could be considered a USDW, but activities at NPR-3 are not likely to impact this aquifer.

1c. The permeability of the Steele shale below the surface coupled with the weathering of shale at the surface provides a pathway for shallow groundwater to recharge surface water drainages. Recharge water could come from precipitation or seepage from waste water facilities. Existing problems have required groundwater pollution remediation systems in the Salt Creek area to prevent oil seeps from entering surface waters via groundwater recharge. This indicates consideration for adequate design, construction and operation of reserve pits and disposal facilities is necessary to protect water resources.

Wyoming Groundwater Standards contained in Chapter VIII require the protection of all groundwaters of the state for existing and potential uses. The standards prohibit the discharge of biological, hazardous, or toxic materials or substances into shallow groundwater. The main purpose of the standards is to protect all uses for which the groundwater is suitable and to protect against migration of contaminants to useable groundwaters or surface waters.

The Department of Energy recognizes its responsibility to protect shallow groundwater and to comply with DEQ regulations. Reserve pits and other production facilities will be sited and constructed according to WOGCC standards for critical areas (Rule 401) when they are applicable. Further, the Department of Energy is not aware of any situations at NPR-3, where surface waters have been threatened by oil being transported by groundwater recharge, such as the comments describe.

1d. The statement in section 4.3.4 Ground Water Quality Mitigating Measures (page 4-11), which indicates protection of groundwater is not necessary because there are no fresh water aquifers yielding potentially useable potable water, is incorrect. Appropriate design, construction and operation of reserve pits, earthen waste water treatment facilities and disposal ponds need to be included as mitigation measures to prevent soil, groundwater and surface water contamination. Spill prevention and clean up procedures should be addressed in section 4.3.4 along with other groundwater quality protection methods.

The design, construction and operation of oilfield facilities have added as a mitigation measure. Comments addressing spill prevention, cleanup procedures and other groundwater quality protection methods have also be added to the final EA.

2. The second issue concerns WQD's policy on coverage under the general NPDES storm water discharge permit. Runoff from construction activities has been defined as a point source by EPA and a permit is required. In September 1992, the WQD issued its general permit for storm water discharges from construction activities. WQD's policy for construction activities associated with oil and gas development is that a pollution prevention plan must be prepared and notification for coverage under the Wyoming general permit must be given for each well and associated facilities (roads, pipelines, tank batteries, etc.) that disturb five acres or more.

Additionally, construction of other facilities would require coverage under the general permit if they disturb five acres or more. An indication that coverage under the general permit is required should be given in section 1.5 and should be included as a mitigation measure.

The need for a general stormwater discharge permit has been identified in the EA for facilities that disturb five acres or more.

3. The third issue pertains to livestock grazing on the Naval Petroleum Reserve. This action is not fully analyzed in the

EA. Although listed in Table 2-4 (page 2-14) and mentioned in section 2.1.3 (page 2-13), oversight and management of livestock grazing are not adequately presented as part of the proposed action. Discussions provided in section 4.1.1, 4.4.2, 4.5.2 and 4.5.5 regarding the impacts of grazing are inadequate, and a site specific grazing management plan should be prepared. The plan should specify current range and riparian plant community condition; planned season of use; utilization standards; planned improvements; grazing Best Management Practices (BMPs) that will be used to protect rangeland and riparian resources and water quality; and any other factors relevant to the management of livestock grazing on the Reserve. Preparation of the grazing management plan could be considered a mitigation measure for impacts of livestock and wildlife utilization. If a grazing management plan is prepared as a separate document and not incorporated in the final EA or Decision Document, WQD requests that the plan be made available for review.

A site specific grazing management plan has been prepared and included as an attachment to the EA. Discussion of impacts and mitigation has been expanded upon in the EA to include the topics of concern described above.

4. Review of the Environmental Assessment for the Naval Petroleum Reserve No 3. indicates that there are several proposed projects such as pumping facilities, H₂S treatment facilities, natural gas compressors, flares to burn H₂S contaminated natural gas, expansion or modification of the natural gas processing plant, and enhanced oil recovery technologies which are potential sources of air emissions. Wyoming Air Quality Standards and Regulations, Section 21, requires that any person who plans to construct any new facility or source, modify any existing facility or source, or to engage in the use of which may cause the issuance of or an increase in the issuance of air contaminants into the air shall obtain a construction permit from the State of Wyoming, Department of Environmental Quality before any actual work is begun on the facility. Section 21 (b) further explains the permit application procedures.

Also note that page 3-5 of the Environmental Assessment states that predicted emissions of Nitrogen Oxides (NO_x) increased to greater than 100 tons per year in 1993. This level exceeded the Title V Operating Permit Program threshold and will subject NPR No. 3 to the permitting requirements of Section 30 of the Wyoming Air Quality Standards and Regulations.

The Department of Energy is aware of the need for a Title V Operating Permit. A consulting firm is in the process of preparing the permit application, which will address all regulations applicable to NPR-3's current and planned operations.

Issue 5 was raised by the Wyoming State Office of Historic Preservation (SHPO).

5. The last cultural resource inventory performed at NPR-3 was in 1976. Cultural resource surveys conducted prior to 1980 usually do not meet current inventory or evaluation standards. Additionally, "it is stated on page 4-21 that, 'Impacts to cultural resources from the Proposed Action would be limited to the effects of ground disturbing activities'. This statement is inconsistent with standard practices for determining effect, as outlined in *National Register Bulletin 15, How to Apply the National Register Criteria for Evaluation*. Oil field activity has the potential to impact integrity of setting, design, workmanship, feeling, and association for sites significant under National Register criteria A, B, or C. Both direct and indirect effects to historic properties must be considered on a project by project basis."

A Class III Cultural Resource Inventory was conducted of NPR-3 from February to June of 1995. This information will be sent to the SHPO. As stated in the text, only two sites were found to be eligible for listing on the National Register. These sites will be avoided. To address the possibility of effects to cultural resources from groundbreaking activities, and to meet requirements of the National Historic Preservation Act, a Programmatic Agreement will be developed with the Wyoming SHPO and the National Advisory Council.

A Class III cultural resources inventory has been contracted for NPR-3. Work is expected to start in February, 1995 and will be completed within a 60-day project schedule (depending on snow cover). Copies of the final report will be made available to the SHPO when it is published. At that time, the Department of Energy will also submit a proposed Memorandum of Agreement to cover mitigation of potential impacts to the cultural resources that were found in the survey. The MOA will be signed before a decision document is completed by the Department of Energy. If appropriate, the decision document would be a Finding of No Significant Impact (FONSI).

Department of Energy Continued Development - Naval Petroleum Reserve No. 3 Finding Of No Significant Impact

Proposed Actions: The Proposed Action is the continued development of the Naval Petroleum Reserve No. 3 (NPR-3) for five years. Continued development includes all activities typically required to profitably manage a mature oilfield such as NPR-3.

In addition to the continued development of oil and gas resources, it is proposed to fully develop the Rocky Mountain Oilfield Testing Center (RMOTC). The mission of RMOTC would be to provide facilities and necessary support to government and private industry, for testing and evaluating new oilfield and environmental technologies, and to transfer these results to the petroleum industry through seminars and publications.

Type of Statement: Final Environmental Assessment (EA)

Lead Agency: The United States Department of Energy

Cooperating Agencies: None

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Abstract: Continued development activities under the Proposed Action (the preferred alternative) would include the drilling of approximately 250 oil production and injection (gas, water, and steam) wells, the construction of between 25 and 30 miles of associated gas, water, and steam pipelines, the installation of several production and support facilities, and the construction of between 15 and 20 miles of access roads. This work would be performed over the next five years. These drilling and construction estimates include any necessary activities related to RMOTC operations.

Continued development activities either have no potential to result in adverse environmental impacts or would only result in adverse impacts that could be readily mitigated. Resource types discussed in detail include land resources, air quality and acoustics, water resources, geology and soils, biological resources, cultural resources, socioeconomics, and waste management. Continued development is not expected to result in substantial changes in the types and quantities of air emissions and wastewater discharges already generated by existing operations at NPR-3. Continued development, especially where it involves expansion of EOR activities, would result in small areas of new land disturbance at several locations on NPR-3, especially in the already intensively developed central area.

AGENCY: Naval Petroleum and Oil Shale Reserves

U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI) for the Continued Development of Naval Petroleum Reserve No. 3 (DOE/EA-1008)

SUMMARY: The Secretary of Energy is required by law to "explore, prospect, conserve, develop, use, and operate" the Naval Petroleum and Oil Shale Reserves. The Naval Petroleum Reserves Production Act of 1976 (Public Law 94;258), requires that the Naval Petroleum Reserves be produced at their maximum efficient rate (MER), consistent

with sound engineering practices, for a period of six years. The President has authorized five 3-year extensions to the six year period since 1982. The United States Department of Energy (DOE) has managed NPR-3 for oil recovery at the "Maximum Efficient Rate" (MER) since 1976.

To fulfill this mission, DOE is proposing continued development activities which would include the drilling of approximately 250 oil production and injection (gas, water, and steam) wells, the construction of between 25 and 30 miles of associated gas, water, and steam pipelines, the installation of several production and support facilities, and the construction of between 15 and 20 miles of access roads. This work would be performed over the next five years and will mainly utilize practices standard to the industry. These drilling and construction estimates include any necessary activities related to the operation of the Rocky Mountain Oilfield Testing Center (RMOTC). The development of the RMOTC at NPR-3 is included as part of continued development activities. The purpose of RMOTC will be to provide facilities and necessary support to government and private industry for testing and evaluating new oilfield and environmental technologies, and to transfer these results to the petroleum industry through seminars and publications.

Continued development activities either have no potential to result in adverse environmental impacts or would only result in adverse impacts that could be readily mitigated. Continued development is not expected to result in substantial changes in the types and quantities of air emissions and wastewater discharges already generated by existing operations at NPR-3. Continued development, especially where it involves expansion of EOR activities, will result in small areas of new land disturbance at several locations on NPR-3, especially in the already intensively developed central area. The small amounts of disturbed surface area will be reclaimed to its original natural state when production operations terminate.

DOE prepared an environmental assessment (DOE/EA-1008) that analyzes the proposed projects involved with continued development of NPR-3. Based on the analyses in the EA, the DOE finds that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). The preparation of an environmental impact statement is not required, and the DOE is issuing this Finding of No Significant Impact (FONSI).

PUBLIC AVAILABILITY: Copies of the EA and FONSI will be distributed to persons and agencies known to be interested in or affected by the proposed action and will be made available for public inspection at the Natrona County Public Library, Kelly Walsh High School, Natrona County High School and the U.S. Department of Energy Reading Room. Anyone wishing to receive copies of either document, or further information on the proposal, should contact:

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SUPPLEMENTAL INFORMATION: Section 7422 of Title 10, United States Code, charges the Secretary of Energy with the authority and responsibility to "explore, prospect, conserve, develop, use, and operate the naval petroleum reserves." This section further provides that the "...naval petroleum reserves shall be used and operated for their protection, conservation, maintenance and testing," and production when authorized.

NPR-3, or Teapot Dome, is a 9,481-acre (3,837 ha) oilfield located in Natrona County, Wyoming, approximately 35 miles (56 km) north of the City of Casper. Production at the Naval Petroleum Reserve No. 3 in Natrona County, Wyoming, began in the 1920s during a time of substantial exploration and production, when leases were issued by the Interior Department under the Mineral Leasing Act. Production was discontinued after 1927 and renewed between 1959 and 1976 in a limited program to prevent the loss of U.S. Government oil to privately-owned wells on adjacent land. In 1976, Congress passed the Naval Petroleum Reserves Production Act (Public Law 94-258), which requires that the Naval Petroleum Reserves be produced at their maximum efficient rate (MER), consistent with sound engineering practices, for a period of six years. The law also provides that at the conclusion of the initial 6-year production period, the President (with the approval of Congress) could extend production in increments of up to three years each, if continued production was found to be in the national interest. The President has authorized five 3-year extensions since 1982, extending production continuously through April 5, 1997.

The Proposed Action is the continued development of NPR-3 for the next five years. Continued development includes all activities typically required to profitably manage a mature stripper oilfield, such as NPR-3, at the MER. Continued development comprises four general categories of activity: continued development drilling utilizing conventional oil recovery technologies; continued and expanded use of Enhanced Oil Recovery (EOR) techniques that are necessary for continued oil production from reservoirs after primary or secondary recovery; continuation of general operations and support activities; and full implementation of the Rocky Mountain Oilfield Testing Center.

Continued development activities either have no potential to result in adverse environmental impacts or would only result in adverse impacts that could be readily mitigated. The Sitewide EA summarizes the potentially affected environment at NPR-3 as of 1994, discusses all potentially adverse environmental impacts, and proposes specific mitigation measures that offset each identified adverse impact. Resource types discussed in detail include land resources, air quality and acoustics, water resources, geology and soils, biological resources, cultural resources, socioeconomics, and waste management.

Continued development of NPR-3, as outlined in the Proposed Action, would not substantially alter the character of existing operations and would be consistent with NPR-3's historic role as an oilfield. Continued development is not expected to result in major changes in the types and quantities of air emissions and wastewater discharges already generated by existing operations at NPR-3. Continued development, especially where it involves expansion of EOR activities, would result in small areas of new land disturbance at several locations on NPR-3, especially in the already intensively developed central area.

Alternatives to the Proposed Action that were reviewed include: other chemical and thermal EOR technology alternatives to maintain oil and gas production, divestiture of NPR-3 by the Federal government, a no-action alternative of continuing operation of NPR-3, but without further development, and the immediate decommissioning of the project.

DETERMINATIONS: Based on the findings of the EA, DOE has determined that the proposal does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an environmental impact statement is not required, and DOE is issuing this FONSI.

Issued in Casper, WY, _____, 1995

Clarke D. Turner
Director
Naval Petroleum and Oil Shale Reserves in Colorado, Utah and Wyoming